THE GAS JOURNAL

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A Glance at the Contents—

"Journal" Handbook, 1934.

Attention is called to a correction to p. 186 of the "JOURNAL" Handbook, 1934. It concerns the sampling of coke. [p. 605.]

Gas Installations at Stratford-upon-Avon.

Important gas installations for cooking, hot water supplies, central heating, &c., have recently been carried out at Stratford-upon-Avon. [p. 620.]

Comparative Working Results.

A comparative table of the three metropolitan and six of the suburban gas companies is published, showing the working results and the revenue account costs per therm sold for the year 1933. The table is compiled by Mr. F. J. Bradfield, of the Commercial Gas Company. [p. 610.]

Benzole Washing of Gas from Horizontals.

In a paper before the Manchester and District Junior Association Mr. H. G. Davison gave a brief description of the de-benzolizing plant in operation at Chester, an account of the method of working adopted, and a summary of the results obtained and operating costs incurred over a period of six months. [p. 625.]

A New Recording Gas Calorimeter.

Mr. W. Masterton described to the Scottish Junior Gas Association (Eastern District) a new type of recording gas calorimeter of his own design. [p. 626.]

Hire-Purchase Problems.

Mr. A. V. Bishop, of Ipswich, advocates a more or less national agreement in the matter of hire purchase in the interests of both consumers and the Gas Industry. [p. 628.]

Gas Company Meetings.

Reports are published of the annual meetings of the Lea Bridge and Hornsey Companies, together with the year's results of a large number of provincial undertakings. [p. 629 *et seq.*]

London Section of the B.I.F.

Attractive exhibits were staged at the London Section of the B.I.F., at Olympia, by the Gas Light and Coke Company and the South Metropolitan Gas Company, both of whom displayed examples of their tar and chemical products. [p. 618.]

Forthcoming Engagements

March 10.—WESTERN JUNIOR ASSOCIATION.—Meeting at Plymouth. Paper by Mr. A. R. Langford.

March 10.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Annual Business Meeting. Paper by Mr. H. S. Milne.

March 13.—N.G.C.—Meeting of Central Executive Board, 28, Grosvenor Gardens, S.W. 1.

March 14.—I.G.E.—Meeting of Meters Committee, 2.30 p.m.

March 14.—YORKSHIRE JUNIOR ASSOCIATION.—Joint Meeting at Warrington with Manchester and District Juniors. Paper by Dr. Winter.

March 15.—S.B.G.I.—Council Meeting, 11.30 a.m.

March 16.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. L. T. Minchin.

March 16.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (WESTERN DISTRICT).—Commercial Meeting at the Rougemont Hotel, Exeter, 2.30 p.m.

March 20.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at No. 28, Grosvenor Gardens, S.W. 1. Discussion on "Gas Tariffs."

March 21.—B.C.G.A.—Meeting of Executive Committee, 12 noon, 28, Grosvenor Gardens, S.W. 1.

March 23.—MANCHESTER DISTRICT ASSOCIATION.—Annual Meeting at the Midland Hotel, Manchester. Luncheon, 1 p.m. Business Meeting, 2.30 p.m. Presidential Address of Mr. F. G. Shaw.

March 24.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Batley.

March 27.—SOUTHERN ASSOCIATION.—Annual General Meeting, Hotel Metropole, London, 2 p.m.

April 6.—NORTH BRITISH ASSOCIATION.—Spring Meeting at Perth.

April 6.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. H. H. Brown.

April 7.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Annual Dinner. Paper by Mr. H. Platt.

April 7.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Visit to Messrs. J. G. Stein & Co., Castle Carey. Paper by Mr. R. Malcolm.

April 12.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. F. H. Bate.

April 21.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Rotherham. Paper by Dr. Heathcote.

April 21.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bath Presidential Address and Annual General Meeting.

April 26.—MIDLAND JUNIOR ASSOCIATION.—Annual Meeting. Address by Mr. R. S. Ramsden.

May 4.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Annual Business Meeting.

May 9.—S.B.G.I.—Annual General Meeting and Dinner, Hotel Metropole, London.

May 9.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Visit to Mossley. Paper by Mr. T. Hibbs.

May 12.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Annual General Meeting and Paperette Day in Heriot Watt College, Edinburgh.

June 5-8.—I.G.E.—Annual General Meeting, London.

EDITORIAL NOTES

Working Results of the London Gas Companies

OUR thanks are again due to Mr. F. J. Bradfield, the General Manager and Secretary of the Commercial Gas Company, for his very useful and interesting analysis, which appears elsewhere in this issue, of the working results as disclosed by the accounts of the three Metropolitan and six of the Suburban Companies for the past year. Comparing the figures with those published for the year 1932, the first item which attracts attention is the percentage of increase or decrease in the total gas sold. In 1932 six of the Companies showed decreases, as against seven last year; but the satisfactory feature is that, despite the abnormal weather conditions during nearly the whole of 1933, the decrease in the majority of cases was about half that shown for 1932, while the South Suburban Company converted a decrease of 0·59% into an increase of 1·79%.

The makes of gas per ton of coal compare satisfactorily, and Lea Bridge (with vertical retorts) again lead with 80·43 therms, followed by the South Metropolitan Company (with horizontal retorts) with a make of 75·71 therms, while the Wandsworth Company's make has increased by nearly $1\frac{3}{4}$ therms. The makes of coke and tar per ton of coal, in the majority of cases, were not quite so high as those for 1932, though the South Metropolitan and Croydon Companies are to be congratulated on showing increased makes of both commodities. Lea Bridge are still top with tar, at 15·75 gallons. There are again some large differences in the ammoniacal liquor makes, varying from 40·75 gallons in the case of the South Metropolitan Company down to 23·20 gallons by the Gas Light and Coke Company.

Comparing the principal items in the revenue account at per therm sold, we see that the Gas Light and Coke Company's costs for coal and oil, &c., were again the lowest at 3·07d. The Commercial Company retain the lead in the amount realized from residuals at 2·47d., with Croydon next at 2·26d. With regard to the cost of coal, oil, &c., less residuals, it is interesting to note that each of the three Metropolitan Companies is again cheaper than any of the Suburban Companies shown in the analysis, with Commercial still lowest at 1·17d. per therm. This is an increase in their case compared with 1932, though with one exception the cost for the other Companies is either less than or comparable with that of the previous year. Most of the Companies show slight increases in the cost of total net expenditure, Gas Light and South Metropolitan being the cheapest at 7·66d. and 7·74d. respectively, with Commercial very close at 7·76d. per therm. The price realized for gas varies from 7·89d. (Hornsey) to 9·10d. (South Suburban); and apart from an increase of 0·4d. per therm to 8d. per therm from July 1 last by the Wandsworth Company, the flat rate charged by all the Companies in their principal areas of supply has remained the same for the past two years.

Comparing the sundry figures at the bottom of the analysis with those for 1932, we notice that each undertaking shows a reduction in the cost per ton of coal carbonized, the Tottenham Company showing the greatest saving at nearly 1s. 1d. per ton, while the South Metropolitan are again the cheapest at 19s. 6d. per ton. The net receipts from coke per ton are somewhat disappointing, and all show decreases under this head, but nearly every Company has realized a higher price per gallon of tar. Six Companies still show a loss on ammoniacal liquor, but it is satisfactory to note that the deficiencies are reduced, and Gas Light and Lea Bridge have this year come out on the right side. The Commercial Company again shows the highest yield at 11·35d. per butt.

Questions of Account

As with all other services for which an account is rendered, in either commercial or professional life, consumers of gas from time to time request information as to charges made, and the subsequent inquiry—or "bill investigation," as it is termed—is suggested by a Committee of the American Gas Association as an opportunity for the gas undertaking to establish friendly relations with this inquiring customer. A study which the Committee have undertaken of the results of a number of investigations into charges made to customers has revealed that it is possible to convince 84% of a given group of customers of the fairness of the bill rendered. No doubt this is a high percentage, but there seems to be no reason why a still better result should not be aimed at.

The investigation, which included a number of companies serving widely scattered sections of the United States, for determining the causes of bill complaints, revealed economic conditions as being the principal one; for, as the Committee point out, "families have been combining, new mouths have appeared at family tables, and as a result the gas bill has increased, while the housewife has been making every effort to reduce the family budget." Second only to economic conditions is the result of seasonal temperature variations. Of course, in the United States people are accustomed to wider temperature variations than are experienced here; but even in this country it is to be feared that weather conditions are likely to remain the cause, on occasion, of a certain amount of dissatisfaction with gas bills. It may not be out of place, therefore, to mention the plan adopted for getting over the difficulty by a gas company in Texas, who "answer the 'high bill' complaint with a 'picture.'" That is to say, a graph of the weather is so set up as to show vividly the weather and temperature variations. On this chart the present season is compared with the one of a year ago. It appears to be a useful suggestion that such a chart might be included with bills sent to house heating customers. But in any procedure of this character it has to be remembered, as the Committee point out, that any form of information which would allude obviously to the possibility of increased consumption might arouse suspicion in the minds of many, and so would no doubt cause an increase in the number of complaints.

In a preliminary study, it was found that what the customer thought was the cause of an unusual billing could be classified roughly under eighteen different headings; and while the opinion of the customer does not necessarily indicate the truth, this classification was felt to be valuable in determining what training should be given to the employee detailed to interview the customers. It should be remarked that the investigation so far has pointed to the need of a specialized group of trained men to handle this work; the general idea being that this training should embrace: Knowledge of operation and gas consumption of appliances; contact training; knowledge of commercial division procedure, billing, checking, &c.; familiarity with the operation of meter; knowledge of rate structures; and knowledge of company policy. In training district investigators to study the operation of appliances, a division should be made between the large volume customer and the small volume or domestic consumer.

The Committee remark that the general disapproval they experienced of the telephone for use in bill complaints indicates that, in the event of such a call coming in over the telephone, it would be advisable to take steps to call back the customer after sufficient time had elapsed

to permit of a search into the necessary records. In this connection, they point out that a rapid means of securing ledger information for the waiting customer, both on a personal call and on telephone calls, is essential. Readers will have noted lately from the "JOURNAL" the complete arrangements that have been made by the Philadelphia Gas-Works Company to overcome any possible objections to the use of the telephone for this purpose. Philadelphia has no worrying delays in "securing ledger information for the waiting customer."

A Call to Action

WE need no reminder that the Gas Industry is faced with competition keener than ever before; we do need, however, to be told how this competition is to be met. The Joint Gas Conference held at the British Industries Fair last week was helpful in this respect. In his Presidential Address Sir Francis Goodenough, referring to electrical propaganda, said that it must be de-bunked—must have its fancies squeezed out and replaced by commonsense and realities—and that the hopes of the electricity industry of increased sales of current by the capture of business from the gas undertakings of the country will not be fulfilled if the Gas Industry in general and the B.C.G.A. in particular can help it. Sir Francis appealed to all gas undertakings to make sure that their service and publicity are modern and effective beyond reproach. We have all to realize, and continually to remind ourselves, that modern days demand modern ways; we must not content ourselves with past achievements. We must "determine to win, as we can and shall win, fresh laurels in the future through activity, initiative, and courage."

We look forward to the campaign of the B.C.G.A. against the type of propaganda which is being issued by the electricity industry, and hope that municipal undertakings will be just as anxious to support the campaign as are company undertakings. The advertising of the potential services of gas, as a public utility, is a public duty; it is a public duty all the more urgent because of the biased attitude of Ministers of the Crown in favour of electricity. All manner of occasions, such as the opening of bridges, provide opportunities for gratuitous boosting of electricity. Last week the Minister of Transport, Mr. Oliver Stanley, was at the Fair at Castle Bromwich. He spoke of the importance to the community of cheap electricity, and remarked that no one could blame them for concentrating attention on a particular section of British industry. Well, if no one can blame a Minister of the Crown for concentrating attention on electricity, which is in competition with an all-British industry which, with a capital of £200,000,000, employs 115,000 people, Britain has certainly changed. According to the *Birmingham Mail*, in an interview following his tour of the Fair, Mr. Stanley said: "I was especially interested in the greatly enlarged electrical section, because with the completion of the grid this year we shall be seeing something like a new industrial revolution in this country." We were glad to see in the same issue of the *Birmingham Mail* a strong protest from Sir Francis Goodenough against this grossly unfair advertising of electricity by one who should be entirely impartial.

As an Industry we must fight this neglect by better service and up-to-date salesmanship, by multiple tariffs and more skilful advertising. The Gas Industry is a key industry to Great Britain, and the nation can ignore its services only at peril. Fundamentally the processes of the Industry are in the best interests of the community. It is unnecessary to repeat the reasons for this statement to our readers, but it is vital that our readers should continuously let the public know these reasons. No excuse can be offered by members of the Industry for lack of faith in the future of gas. There is neither time nor place for teeth-chattering because a new and higher wave of competition is breaking. On the other hand, a little more energy and purpose in business getting—the abandonment of the retort house assessment of profits—is essential.

That "Inferiority Complex"

NOT once but twice within the past week or two have we seen references to an "inferiority complex" in relation to the Gas Industry. The first occasion was when, at the annual dinner of the South Wales Branch, Mr. Alan E. L. Chorlton, M.P., the President of the Institution of Mechanical Engineers, suggested to gas engineers that they should "get rid of the inferiority complex." Then last week, in the paper which he presented at the Joint Gas Conference at the British Industries Fair, Dr. E. W. Smith touched upon the same point, when he said: "It it regrettable to have to acknowledge that a part of the personnel of the Gas Industry is suffering to-day from a sort of inferiority complex." It is true Dr. Smith went on to explain that "this certainly does not apply to the big majority of those engaged in our Industry;" but we agree with him that "a small leaven of defeatists is a very enervating constituent within our ranks." We would, indeed, be inclined to put the possible effect of even "a small leaven of defeatists" higher—or should we say lower?—than Dr. Smith does. It is a spirit that should be exorcized.

What is the excuse for this defeatist attitude, anyway? In the first place, it is inimical to that state of unity which is desirable in any industry that is faced with ceaseless competition; and, in the second place, there is so much good reason for a hopeful view. Success has to be earned, of course. In these days, there are few "Royal Roads" to be found anywhere; but, given effort, the way to success lies open. Dr. Smith is undoubtedly right in his belief that, "with courage, unselfishness, and a playing for the team, there is nothing that can stop the achievement of a success within our Industry which has been undreamt of in recent years." Courage is necessary to scale any height; unselfishness brings big rewards; but, above all, there is *playing for the team*, as the key to success.

All around us we see an uplifting. Clouds of depression are moving—slowly, perhaps, at first, but the dispersion will be more rapid as time passes, and the Gas Industry need not be behind any other in seizing the good things that will offer. The Chairman of the Westminster Bank (the Hon. Rupert E. Beckett), in his speech a month or more ago at the annual general meeting, when referring to the economic situation, expressed the view that sound foundations have been laid for real progress, and said he hoped the time was approaching when, as one of the rewards for the great sacrifices made and burdens shouldered during the emergency two years ago, the people of this country might receive some alleviation of the loads that they have been carrying. Since then the Chancellor of the Exchequer has warned the public against too high expectations of the Budget, but we must be getting near the time when there will be some lessening of the handicap to trade improvement which the existing staggering income-tax level represents.

Meanwhile, as we have said, progress is being made, and it may reasonably be expected to continue at an increasing rate. Of recent weeks our pages have contained reports of gas company meetings which have been full of past achievement and future promise. No lack has there been of subject-matter for headlines, but here we must content ourselves with the remark that concrete evidence has been forthcoming that, with improved industrial conditions, there will be larger gas sales. Take, as an example, Derby, which is a representative industrial town. What did the Chairman, Alderman Sir John Ferguson Bell, have to tell the proprietors at the meeting, in connection with the large increase in the use of gas for industrial purposes? "Since July last, there has been a marked increase, and since the beginning of this year this rate of increase has been fully maintained. During last month [January] the increase was just over 15%." There will be plenty of business to be had—at a price—and the Bill of which we gave full details in the "JOURNAL" a week ago, to amend the law with respect to gas undertakings, should be of material assistance in enabling the Industry to secure this business, by facilitating the entering into of special contracts for the supply of large quantities of gas at attractive prices.

PERSONAL

Mr. HENRY COVERDALE, of Pickering, Yorks, Vice-Chairman of the Pickering Gas and Water Company, left £10,165 (net £7,139).

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The Directors of the Stamford and St. Martin's Gas Light and Coke Company have appointed Mr. EDWARD DALTON, who for 19 years has occupied a seat on the Board and for several years has been Vice-Chairman, to succeed Mr. James Ringham in the chair. Mr. Ringham has resigned the position, which he has held for 15 years, owing to failing health. He has been a Director for 41 years. Mr. Charles Dalton, brother of the new Chairman, succeeds the latter as Vice-Chairman.

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At the annual prize distribution of the Plymouth and Devonport Technical College special mention was made of the fact that Mr. RICHARD G. PARKER had been awarded the William Cartwright Holmes Scholarship in Gas Engineering at Leeds University.

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At a special meeting of the Manchester City Justices' Gas Meter-Testing Committee recently Mr. H. N. BARROW was appointed Chairman for the fourteenth successive year. In submitting the resolution, Mr. W. H. Hesketh spoke of Mr. Barrow's enthusiasm for his work and the way the station had prospered under his care. The resolution was passed unanimously. On the motion of Mr. F. Fenn, Mr. HAROLD KING was again appointed Vice-Chairman.

OBITUARY

JOHN YOUNG.

The death has taken place of Mr. John Young, a Past-President of the Institution of Gas Engineers, who retired in 1919 from the position of Engineer and Manager of the Hull Station of the British Gas Light Company, Ltd.

Mr. John Young was born in Grangemouth, his father holding the position of Engineer and Manager to the Gas Company there. He commenced his business career at Hull in 1873, his father being then Engineer and Manager of the Hull Station of the British Gas Light Company, Ltd. In 1874, Mr. Young, Senr., was appointed Chief Engineer to the Sheffield Gas Company, and Mr. Young spent the next three years in the office of the Borough Engineer and Surveyor at Sheffield. In 1877, the family moved to Pittsburg, and, in 1879, while in England in connection with family business, Mr. Young was appointed Assistant Engineer and Manager at the Potteries Station of the British Gas Light Company, Ltd.

From 1883 to 1885, deceased was Engineer and Manager to the newly formed Fenton Urban District Council Gas Department, and in 1885 he returned to the British Gas Light Company as Engineer and Manager of their Potteries Station. In 1897 he was appointed Engineer and Manager of the Norwich Station of the Company, and in 1901 Engineer and Manager of their Hull Station, thus succeeding to the position which his father had held nearly 30 years before. He retired from this position in 1919 after 34 years' continuous service with the Company.

In 1905 Mr. Young was elected an ordinary Member of the Council of the Institution of Gas Engineers. Three years later he was District Member of the Council for the Eastern District Gas Managers' Association, and, at the end of that year, was again elected an ordinary Member of the Council. After serving as Junior and Senior Vice-President, he was President in 1915-16, so that, at the end of his three years as Past-President, he had served on the Council for thirteen years without a break. In 1921 he was elected an Hon. Member of the Midland Association of Gas Engineers and Managers.

During the Great War, Mr. Young was a member of Lord Moulton's Committee on High Explosives and was responsible for toluole recovery in Yorkshire, Durham, and Northumberland. For this service he was invested with the Order of the British Empire.

Deceased was Hon. Secretary of the Port of Hull Society's Sailors' Orphan Homes for fifteen years, and his loss to that Institution will be felt very keenly. He was one of the original members of the Scots Society of St. Andrew in Hull and was, for a number of years, President of the Society. Always a lover of music, he was, up to the time of his death, Chairman of the Executive Committee of the Hull Philharmonic Society and he was also on the Council of the Hull Literary and Philosophical Society. An enthusiastic golfer, Mr. Young was President of the Beverley Golf Club, of which he was a former Captain, and it was while playing golf there on Feb. 17 that he collapsed.

Mr. Young had been identified with the Hull Savings Bank since 1926. He was appointed to the Committee of Management in 1931 and was appointed Chairman at the beginning of this year. He was appointed a Justice of the Peace some years ago. Deceased was also Chairman of the Hull Hydraulic Power Company and of the Brough, Elloughton, and District Gas Company. Mr. Young leaves two daughters and a son.

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The death has occurred of Mr. R. TAYLOR, Superintendent of the Bolton Corporation Public Lighting Department.

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The death is announced at Berwick-on-Tweed, of Mr. R. P. LEE, who has been a Director of the Berwick and Tweedmouth Gas Light Company for 32 years, and its Chairman for 20 years. Mr. Lee, who was 77 years of age, was a well-known jeweller in Berwick.

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The death occurred at Kingswood, Surrey, after a long illness, of Mr. WILLIAM WALTER BAKER, Chairman of the Altrincham Gas Company since 1925. Mr. Baker was 70 years of age and had long been associated with the public life of Altrincham, having at one time been Chairman of the local Urban District Council and also Mayor of the Borough. He had been a Director of the Gas Company for many years, acting as Vice-Chairman prior to his appointment as Chairman; he was also a Director of the old Stretford Gas Company.

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The funeral took place at North Shields on Monday of Mr. JOSEPH JAMES CARR, a former Secretary of the old Tynemouth Gas Company, whose death took place at Barvie, Derbyshire, last week. The Newcastle and Gateshead Gas Company, who took over the Tynemouth Company, were represented by Mr. T. P. Ridley, Secretary and Commercial Manager, and Mr. W. E. Oulds, Distribution Superintendent.

CORRESPONDENCE

Gas-Operated Wireless Sets.

SIR,—The recent developments in the provision of power to operate wireless sets by the use of electricity direct is now incorporated in nearly all wireless sets, thus eliminating the oncost and inconvenience of accumulator charging and H.T. battery renewals, and it has been the means of very many users of wireless adopting this type. This in turn causes them to consider the introduction of electricity into their houses, and although they are perfectly equipped and satisfied with their gas lighting, they install electricity for lighting to enable them to have the current for their wireless. The electricity people are not slow to develop this means of obtaining new business, while the gas interests are the losers.

I should like to learn through the medium of your paper whether there is available or likely to be some form of current generator operated by gas which could counteract this menace.

A few years ago a French firm introduced a gas-operated low tension generator which operated in a satisfactory manner, but the objections were size, initial cost, appearance, and running cost. With development it would have been greatly improved in these respects, and I do not know whether this firm are still in existence, or developing this apparatus further.

I am of opinion that, could a gas-operated apparatus be devised which would provide all the power for wireless sets, to be retailed at a reasonable price, the Gas Industry would have a very powerful ally to help it retain the lighting load.

Yours, &c.,

"WAVE-LENGTH."

THE NEWS OF THE WEEK

The Annual Conference of the B.C.G.A. has been arranged to take place in Sheffield on Sept. 24-26.

The 75th Annual Meeting of the German Association of Gas and Water Engineers is to be held in Frankfort-am-Main on May 28 and 29 next.

The Manchester Corporation has appointed Mr. Frank H. Jones, M.Inst.C.E., to advise the Special Committee which is inquiring into the affairs of the Manchester Gas Undertaking.

The Society of British Gas Industries will hold their Annual General Meeting at the Hotel Metropole, London, on Wednesday, May 9, under the Presidency of the Right Hon. Earl Fitzwilliam, K.C.V.O. The Annual Dinner will take place in the evening.

Practical Tests on Refractory Cements are included in the articles in the current issue of "Sands, Clays, and Minerals," published by A. L. Curtis, of Chatteris. This magazine now enters its second volume, and there is no diminution in the usefulness and interest of the publication.

"**Punch**" celebrates the centenary of George du Maurier in a special Supplement to the current number, the pictures chosen illustrating the many-sided activities of the artist. The opening illustration of the Supplement is du Maurier's first contribution to *Punch* in 1860, and contains portraits of himself and of Whistler.

London and Counties Coke Association.—In the "JOURNAL" for Feb. 21, in our report of the annual general meeting of the Association, it was stated that members last year produced for inland sale over 90% of the total coke produced within the area covered by the Association. This figure of 90%, which occurred on pp. 457 and 467, should read 98%.

During the B.I.F. at Castle Bromwich the Prince of Wales visited the Fair, and for the second time, while passing through the Gas Section, stopped at the stand of Messrs. George Wilson (Gas Meters), Ltd. After expressing admiration of the lay-out of the stand, the Prince showed great interest in the progress of meter construction since his last visit two years previously.

A Wide Area was Affected by an electricity failure covering Wimbledon, Richmond, Twickenham, Teddington, Merton, Morden, Raynes Park, Hampton, Weybridge, Walton-on-Thames, and adjacent districts on the night of Feb. 27. Wimbledon Hospital was in darkness until candles were obtained, but the Nelson Hospital, Merton, was able to bring an emergency gas lighting system into operation.

The Whole Town and Surrounding District, dependent on the Newport (Mon.) Corporation Electricity Department, were affected last week when there was a breakdown at the East Power Station shortly after 7 a.m. on Friday morning. The tramcars conveying workmen suddenly stopped, and 'buses hastily had to be placed on the routes. Those dependent upon electric cookers had to delay their breakfasts, while the chief regret, stated a local newspaper, was shared by those who prematurely inserted shillings in their slot meters when the electric lights failed.

A Harrogate Centre of the Gas Development Association for Women—the first section of which was formed at Halifax a few weeks ago—was established last week at a meeting at the headquarters of Harrogate Gas Company. This is the second section of the new movement in the country. The gathering included the Mayoress of Halifax (Mrs. F. A. Leach, who is Hon. President of the original Centre at Halifax); the Mayor and Mayoress of Harrogate (Mr. and Mrs. J. H. Newsome); Mr. F. Barber, Chairman of the Harrogate Gas Company; Mr. J. A. Seaton, Secretary; Mr. C. Bateman, Engineer and Manager; and Mrs. J. H. Waddington, Chairman of the Executive of Halifax Centre and wife of Alderman Waddington, Chairman of Halifax Gas Committee. The Committee is being formed of influential Harrogate ladies to put the new Centre into working order.

The Difficulties Experienced by the Gas Committee with regard to gas supplies to new property, owing to the practice of the electrical undertakers offering to lay cables into each house free of cost, was the subject of a report to the Lymm Council recently. It was resolved that the Council be recommended to authorize the laying of pipes on private land, and make gas connections free of charge in all cases where the cost of reaching any house does not exceed £2.

The Clyde Valley Gas Supply Company, Ltd., reports that it has now received the necessary statutory order from the Board of Trade, and orders will be placed almost immediately for plant for their new gas-works at Netherburn, Lanarkshire. The Clyde Valley is a tomato-growing district and large quantities of raw coal for heating purposes are used by the growers. The Company's intention is to supply them with gas at a price which will mean a big saving to the growers. In an interview, Mr. M'Laurin, principal of the firm, said that they expected to be producing gas by September.

A Revue produced by the Works Staff of the Parkinson Stove Company, Ltd., had a very successful three nights' run last week in the Canteen at Stechford. Entitled "Birma," a Curvex Fantasy in 9 Radiants, the production and acting reflected great credit on all concerned. Crowded audiences, including a good number of visitors to the British Industries Fair, showed their appreciation in no uncertain manner. The book, which was written by Mr. E. Timms, a member of the Works Staff, had many topical allusions, and for a first production all the members of the cast are to be congratulated on the success of their efforts.

The Price of Gas for Industrial Purposes consumed in excess of a certain amount has been reduced in Belfast. The price of 1s. 10d. net per 1,000 c.ft. for the first 250,000 c.ft. is still the rule, but gas consumed in excess of that amount will in future be at the rate of 1s. 6d. per 1,000 c.ft. The rate for gas supplied outside the city boundary has also been lowered. The average was from 2s. 10d. to 3s. 10d. net, but now it is to be a uniform 2s. 8d. per 1,000 c.ft., or for prepayment meters 27 c.ft. for 1d. The Manager (Mr. J. D. Smith) recommended the reductions (1) to forward the industrial revival, and (2) to ensure that the Gas Undertaking might secure its share of the new business springing up in every direction in the areas around Belfast.

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Our attention has been called to an inaccuracy in the Coke Section, p. 186. To the opening paragraph after the italic side heading "Sampling" should be added:

> The increments shall be approximately equal in weight, and the number taken shall be in accordance with the following table. If the approximate moisture content is not known, the maximum number of increments shall be taken.

In the table which follows, the figures 280, 295, 315, and 335 in the third column refer to "Graded Coke Only."

British Papers before the Canadian and American Gas Associations.

Bound copies of the Proceedings at the 26th Canadian Gas Convention at Ottawa and at the 15th American Gas Convention at Chicago in 1933 can (by courtesy of the Canadian Gas Association and the American Gas Association) be obtained at the special member-price of 12s. 6d. and 6s. 3d. each respectively, if orders (accompanied by the appropriate remittance) are placed with the Secretary of the Institution of Gas Engineers, 28, Grosvenor Gardens, London, S.W. 1, before March 14 next. After that date copies (if then available) can only be supplied at non-member-prices. All the British Papers presented at the conferences are reproduced in the Proceedings.

THE NEWS—*continued.*

Sir Arthur Duckham Memorial Fund.

Third List of Donors.

The following further list of donors to the Sir Arthur Duckham Memorial Fund has been received from Mr. J. R. W. Alexander, 28, Grosvenor Gardens, London, S.W., the Hon. Secretary and Treasurer to the Fund, and contains the names of the donors between Feb. 24 and March 2 inclusive. Up to the last-named day 159 donors had contributed a total sum of £2,573.

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Sloane 8266.

The Telephone Number of the Institution of Gas Engineers has been changed from Sloane 8912 to Sloane 8266.

Oil from Coal.

In the House of Commons on Feb. 22 Mr. E. Brown, Secretary for Mines (Leith, L.Nat.), informed Mr. Martin (Blaydon, U.) that the following quantities of oil were estimated to have been produced from coal by various processes in the last three years:—

	Million Gallons.	
	Crude Benzole and Other Spirit.	Creosote.
1931	40	63
1932	39	55
1933	48	60

The figures for 1933 were provisional and subject to revision.

The Electrical Grid.

"Government Puts Taxpayers' Money on Wrong Horse."

Reference to electrical competition and the effect of the grid scheme was made at the annual meeting of the Newmarket Gas Company last week by Mr. J. H. Troughton, J.P. (Chairman, Managing Director, and Secretary).

Addressing the shareholders, Mr. Troughton, said that competition was exceedingly keen and must of necessity continue so, because the grid was completed at enormous costs, but the Electricity Company were not obtaining the large number of customers they anticipated, nor were they able to supply electricity at nearly such a figure as was predicted—indeed, it was very dear, and he was convinced that the subsidy of over 30 millions which the taxpayers, including gas undertakings, provided for the grid would take a very long time to repay—if it was ever repaid. Anyway, the subsidy was very bad business for the Government, and such as would never be entered upon by any business man, nor would any bank lend money or provide it, for interest to be paid out of principal. Electric competition must be keen because they had the capital with interest to repay staring them in the face. It remained to be seen whether the huge cost of the grid could ever be justified.

The Newmarket Gas Company had carbonized last year 5,000 tons, and if this had been sent to generate electricity, the 2,500 tons of coke and 60,000 gallons of tar they sold would have been sent up the chimney to pollute the atmosphere, affecting thereby one of the greatest wastes in civilization. What was the moral? Was it not "Use gas for every purpose possible, and especially to generate electricity?" The Government had put the taxpayers' money on the wrong horse. They should be allowed to invest their own money and ought not to have to pay taxes to be gambled with and provide subsidies for rivals in business.

Fifty-two years ago, went on Mr. Troughton, there was an "electric" scare and some gas shareholders sold out, while wise people bought gas shares to their great advantage. There had been periodical scares since when wise people had profited. Gas stood in the forefront of the investment markets of the world as a safe and solid security, and he advised his friends to buy rather than sell, notwithstanding the electrical grid and the intense competition organized by Sir William Ray, who would annihilate the Gas Industry. It was high time the Government ceased experimenting with electricity—they had done far too much already—and provided legislation for the Gas Industry which was still working under old Acts passed in 1847.

Gas Company's Dinner at Cheltenham.

Dealing with Electrical Competition.

There were nearly 250 guests present at the dinner, which was given by the Directors of the Cheltenham and District Gas Company to all branches of their staff, and Mr. A. L. Morris (Accountant and Sales Manager) presided.

Supporting him were Messrs. S. G. Wood (Chairman of Directors), A. H. Wyatt and H. A. Thomas (Directors), G. F. Ticehurst (Clerk to the Company), L. E. Twycross (Engineer), H. S. Boyes (Assistant Engineer), and F. W. Turner (Secretary of the Dinner Committee).

Submitting the toast of "The Company," Mr. Twycross expressed the thanks of all to the Directors for the very handsome way in which they had made the gathering possible. He did not think he was giving away any secret when he told them the Company had had another good year, to which end all of them had contributed their very best. Only some three short years ago the area of supply

of the Company was 30 square miles and they were empowered to supply gas in twelve parishes only. To-day they had an area of 300 square miles with 107 parishes.

"THE WIZARD IN THE WALL."

Mr. Twycross dealt faithfully with "our friends and competitors," the men who are responsible for "The Wizard in the Wall." Quite recently the Electrical Development Association appointed Sir William Ray, M.P., to be their protagonist or salesman. Sir William went at it bald-headed, and in public made a very serious and, from the gas point of view, a damaging statement. Sir William said as far as he could see electricity was going to strike the knock-out blow to the Gas Industry.

The Gas Industry could not take that lying down, said Mr. Twycross, amid applause. "Personally I would like Sir William Ray to visit the villages in North Gloucestershire and South Worcestershire," he added, "where the Cheltenham Gas Company is operating. Take the village of Broadway. Our friends and competitors have had all the run for three years without gas competition; but in the nine months we have been there we have put on 250 consumers, and practically every one has taken a cooking stove."

After giving other striking details of the Company's success in the competition at Broadway, Mr. Twycross said, "If Sir Willian Ray is not satisfied with that, I may tell you we have been collecting new consumers at the rate of four a day, that is 1,200 a year."

Mr. S. G. Wood (Chairman of the Company), in responding, also referred to the "knock-out blow to gas." Such an idea, he said, was ridiculous. It was his firm opinion that when the public got used to the new thing they would come back to gas. They could not, however, expect this unless they gave the public good services, good appliances, and gas as cheap as they possibly could. It was very gratifying to a Company, extending as they were, that they had had such a success in the outlying districts.

Gas Road Traffic Signals.

Successful Application at Birkenhead.

At Birkenhead is a traffic island successfully lighted by gas. In the centre of the island is a 6-light gas lamp on a 12-ft. concrete column, and surrounding it are four gas-lighted "Keep Left" guard posts. These are operated by single medium-nozzle burners. The lights are clock controlled, the mechanism being housed in a corner of the lighting chamber.

These gas-illuminated signs have given every satisfaction, especially during foggy weather. The assembly at Birkenhead includes a large "Rochester" lamp by Messrs. Wm. Sugg & Co., Ltd.

Future Development of Fuel Utilization.

The Coal Industry Society held a Luncheon at the Hotel Metropole, London, on Feb. 26, when Sir Alexander Walker, K.B.E., gave an Address on "The Future Development of Fuel Utilization." Sir Alexander was Chairman of the Area Gas Committee set up by the Fuel and Power Commission, and in that capacity was largely responsible for the Sheffield Gas Grid.

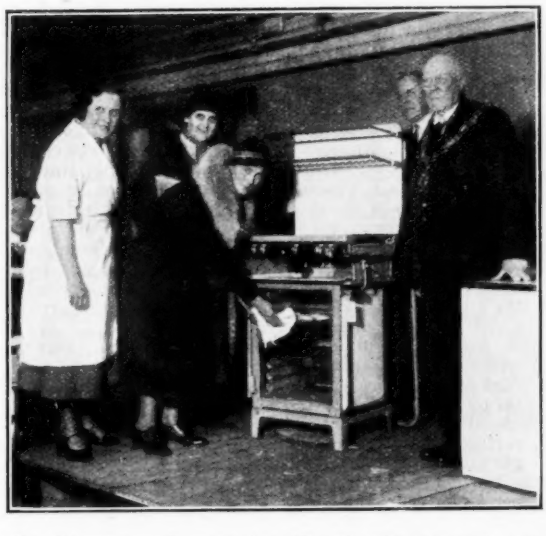
Sir Alexander Walker said he was convinced that the use of gas would increase and displace oil and largely displace petrol. Compressed gas had already been used for traction purposes, although it was only in its early stages. Nevertheless, he was sure from what he knew of it already that compressed gas would be a very important alternative to petrol, perhaps primarily in heavy traction but ultimately, he believed, also in private cars. Compressed gas was vastly cheaper than petrol at the present prices, which of course included the duty. But even without the duty compressed gas would be a competitor.

As a means of reducing the importation of petrol and oil a great deal was to be expected from the use of electricity, coal gas, coke oven gas, and ultimately certain gases obtained from the low-temperature carbonization of coal.

Another matter that had interested him was the development of low-temperature carbonization and also the development of coke produced by gas undertakings or coke ovens. He cared not who produced the coke, but he believed there was a future in that direction which must be considered, and research work must be carried out. There was a great need for a smokeless fuel which was suitable in size and which did not absorb moisture, because the public did not want moisture in the coke, although he believed at the present time 20% was not an uncommon figure. He gathered that the low-temperature people were making a success of this and were producing a coke with sufficient volatiles in it to make it free burning. In his view the public was anxious for such a fuel, and sooner or later the nation would impose as a sumptuary law that such fuel must be used and that no smoke should be allowed to be emitted in our large cities. For these reasons he urged concentration upon the production of suitable smokeless fuels. Col. Bristowe's Company had succeeded in showing a balance on the right side, and it was possible that by a combination of processes better results would be obtained even than by Col. Bristowe's process. However that might be, a great deal of work was being done on low-temperature carbonization and he was very hopeful that this fuel would be the future form of solid fuel consumption in their large cities.

Another factor in the development of an increasing demand for smokeless fuel was the movement that was going on from large houses into small houses and flats.

Miss Ishbel MacDonald Inspects the "New World."



The Lancaster Corporation Health Department organized a most successful exhibition in the Ashton Hall. The Mayor (Mr. H. Warbrick) presided over the opening ceremony, which was performed by Miss Ishbel MacDonald, daughter of the Prime Minister. Gas cookery demonstrations were given at the exhibition and proved very popular, the Radiation "New World" gas cooker being used. Miss Ishbel MacDonald, in touring the exhibition later, evinced special interest in the stand of the Lancaster Corporation Gas Department.

Petrol from Coal.

Big Increase in R.A.F. Contract.

"The prospect of supplying the Royal Air Force entirely with petrol obtained from coal has been improved by the award of the new contract, announced by Sir Philip Sassoon, Under Secretary of State for Air, in the House of Commons," writes the Aeronautical Correspondent of *The Times* in the issue for March 1. "Last year one squadron used home-produced petrol; this year seven squadrons will be flying on this spirit. If the Air Ministry continues its policy of looking to coal for R.A.F. fuel, the output should be sufficient next year for 17 squadrons.

"The cost of this petrol to the Air Ministry is the same as that obtained from foreign sources. The producers are able to compete in this way because their product is not subject to tax. They owe much to the Air Ministry for the encouragement given during the experimental period, but it is also to be noted that the fuel obtained by the Coalite low-temperature carbonization process has given very satisfactory results in service. The new contract means that about 1,000,000 gallons of petrol will be produced for the R.A.F. from British coal in the coming financial year, and some 300,000 tons of coal will be used in the process.

"With the object of increasing the supply two new works are to be equipped. These should be in full use about a year from now and their joint output should be sufficient to supply fuel to 10 squadrons. If this also is taken by the

THE NEWS—*continued.*

Air Ministry, rather more than a quarter of the home defence force will be flying on British coal At the moment it is not certain how far this movement can be carried. The value of a home supply of fuel for the R.A.F. is so obvious that it might be assumed that Air Ministry policy should naturally be to develop the sources of supply.

" In its present stage the industry [*i.e.*, the low-temperature carbonization industry] promises even greater success than was hoped for it."

Gas Department Dinner at Stoke-on-Trent.

The progress of the City's gas undertaking was referred to at the Third Annual Dinner and concert of the Stoke-on-Trent Gas Department, held in Stoke Town Hall.

Mr. A. Mackay, the Chief Engineer, presided, and was supported by the Lord Mayor and Lady Mayoress (Alderman and Mrs. Arthur Hollins), the Deputy Lord Mayor (Alderman T. Mitchell, M.B.E., who is also Chairman of the Gas Committee) and the Deputy Lady Mayoress (Mrs. Mitchell), Mr. J. E. Stanier (Assistant Engineer), Mr. J. Warrillow (Works Manager), and other members of the Gas Committee

The toast of " Those We Serve " was proposed by Mr. J. Johnson, who said: We have over 65,000 registered consumers, and during the last nine months we have added 1,576 new consumers. Those figures speak for the reliability and the efficiency of our service. The numbers we serve probably total a quarter of a million people. Our modern central works at Etruria now possess the latest type of gas compressor, and we are ready to serve anyone with fuel for vehicular transport. Our own Department has had a van running on this fuel quite satisfactorily since last August, and it is a pleasure to note that the local 'bus proprietors are now most interested in the development. Another mark of progress is that since Feb. 5 benzole has been made at our works. During the last few months our City has experienced a trade revival, and we are happy to say that on Dec. 20 our works set up a new record for one day's output, with 7,484,000 c.ft., against the previous highest of 7,271,000 c.ft. in 1930.

Such progress demands increasing vigilance. Our service never sleeps—maintenance and supply go on in 365 days and nights every year; and a very close watch must be kept on over 300 miles of gas mains throughout the City.

Responding, the Lord Mayor said remarkable progress had certainly been made since the centralization in 1922. The gasholder near Stoke City's ground bore the message, " Gas Always Scores," and he agreed that the undertaking had scored in many things. They had a good captain in Mr. Mackay, and he had a jolly good team behind him. Referring to the benzole plant, the Lord Mayor said that 1,200 gallons of benzole per day was being produced. They would readily find a sale for it, and he hoped the Corporation would be one of the best customers. They had scored in the use of gas for kiln firing; one firm alone had used over 25,000,000 c.ft. in a year.

Sharing the response, Alderman Mitchell said the event was the passing of another milestone for him. He had been connected with the gas undertaking for 33 years, and he was never tired of hearing of the service.

Long-Service Medals.

According to custom at these gatherings there were presented by the Lady Mayoress, long-service medals to members of the Department with 25 years' service. Those who received the medals were:

Mr. W. Agar (27 years' service), Mr. T. Shenton (26), and the following with 25 years' service: Mr. R. H. Robinson, Mr. J. Wild, Mr. J. Parton, Mr. E. Meredith, Mr. E. Pritchard, Mr. R. Plimbley, Mr. T. Pointon, Mr. J. Cotterill, and Mr. D. Cope.

Holding Companies and Operating Costs.

In his address as Chairman at the annual meeting of the East Surrey Gas Company, Mr. W. Lees Stenning, M.B.E., J.P., explained that, contiguous with their district was the area of the Horsham Gas Company, Ltd., and, foreseeing the ultimate advantages to be derived from the " linking-up " of the two systems, they had taken advantage of the provisions of the Gas Undertakings Act of 1932 to secure a controlling interest in the Horsham Company. That their offer to purchase the shares in the Company was a fair one was shown by the ready response by the holders, who accepted to the extent of over 80%.

The Chairman went on to say that holders of gas stock would have noticed the formation of a number of " holding companies " in connection with the Gas Industry. While that was not a new practice in America, it was novel in their field of activities in England—and only one of those companies had so far reached any considerable magnitude. The Directors were carefully watching the progress of the policy. If the development made possible reduced charges for gas and better service to the consumer, thus enabling the constituent undertakings to meet growing competition, the movement had advantages. It had yet to be proved, however, that the cost of operating holding companies as at present organized would not be more than the saving in bulk purchasing and the cost of expert technical assistance by which means it was sought to effect economies. Some modification of the present proposals might be necessary if the utmost advantage was to be obtained. But, as he had already said, they were giving constant thought to the matter, and would take all necessary steps to safeguard the stockholders' interests.

New Bridge Over the Tees.

Largest Vertical Lift Bridge in the World.

The Tees (Newport) Bridge, which was opened on Feb. 28 last by H.R.H. the Duke of York, is the first bridge of the vertical lift type to be erected in this country, and is the largest bridge of its kind in the world.

Messrs. Thomas Broadbent & Sons, Ltd., of Huddersfield, have designed, constructed, and assembled the whole of the elaborate machinery for opening and lowering the moving span, and their activities have received very high praise from the authorities. The following comprise some of the principal dimensions of the construction:

Construction commenced March, 1931. *Opened to traffic Feb.* 28, 1934

Total length of bridge and approaches	4,920 ft.
Clear width of river between piers of bridge	250 ,,
Length of lifting span	270 ,,
Width of lifting span	66 ,,
Clearance above high water with span down	21 ,,
,, ,, ,, ,, ,, raised	120 ,,
Height of towers above high water level	182 ,,
Time to raise or lower span with electric drive	1½ mins.
,, ,, ,, ,, petrol engine	2 ,,
Width of roadway	38 ft.
Width of each of the two footways	9 ,,
Weight of lifting span and counterweights	5,400 tons
Weight of steel in each tower	1,120 ,,
,, ,, ,, lifting span	1 530 ,,
Total weight of steel in bridge and approaches, ans	8,000 ,,
,, ,, ,, cast-iron rings in foundation cylinders	750 ,,
,, ,, ,, concrete used	28,000 ,,

The lifting span is connected to the eight counterweights by 160 wire ropes 6¼ in. circumference. The 16 sheaves over which the ropes pass are 15 ft. in diameter and are of steel cast in one piece. They weigh 20 tons each, and run in roller bearings. The cylinders forming the foundations of the bridge are sunk to an average depth of 86 ft. below high-water level and are filled with concrete. The operating machinery consists of two 325-H.P. electric motors and a standby petrol engine of 450 H.P.

The same firm have recently completed a large contract in China, for the Nanking-Pukow train ferry, to enable trains to be carried across the Yangtse River—a tidal river two miles across, and with a rise and fall in tide of 25 ft. They have also supplied electrically-operated bridge opening machinery for many of the largest bridges which have been constructed during recent years, such as the Bangkok Bridge in Siam, the Zambesi in Africa, &c. Messrs. Broadbent have a world-wide reputation for this class of work.

New Canteen Opened at Meter Works.

Messrs. Alder & Mackay's Enterprise.

Mr. J. Miller Thomson, W.S., Chairman of Messrs. Alder & Mackay, Ltd., gas meter manufacturers, Edinburgh, opened a new canteen on Feb. 23, receiving as a memento of the interesting occasion a silver-gilt key handed over by Mr. Andrew Gray. Mr. Miller Thomson, speaking of the goodwill existing between employees and firm, said it was not right that men should eat a hasty meal in the midst of the materials and tools of their daily toil. It was only right that some effort should be made to provide accommodation for workers to consume their meals in clean and wholesome surroundings. A few social moments taken from the day's toil were refreshment to the mind and to the spirit of man. In the canteen they saw an effort by the firm to play their part in the new spirit permeating all industry.

Mr. Thomson said he was by no means sure that he agreed with many people who thought the industrial conditions of

to-day were inferior to those of former times. It was possible to exaggerate the hardships of industrial life, the monotony of certain repetition labour; and the alleged soulless grind of economic forces that tended to turn a man into a mere intelligent machine. No doubt under present conditions there were certain evils, but at the same time there was occasion for comfort and courage in many respects.

Mr. Andrew Gray, Convener of the Canteen Committee, in presenting the key, said the beautiful canteen would be greatly appreciated by all the employees, whose happiness and contentment were prominent factors in the continued success of the firm.

Steel Spigot and Socket Pipes and Specials.

A British Standard Specification of considerable interest to engineers, to municipal authorities, and to water and gas engineers is that for Steel Spigot and Socket Pipes for Water, Gas, and Sewage recently issued by the British Standards Institution.

This Specification has been prepared by a Committee representative of both the manufacturers and users, and among the Committee were: Mr. A. Stokes and Mr. C. A. Masterman, Institution of Gas Engineers; Mr. H. J. Escreet, National Gas Council; Mr. W. Phillips, Gas Companies Protection Association; and the following manufacturers: Mr. J. Parkinson (Bromford Tube Company, Ltd.), Mr. A. N. McQuistan (Cochrane & Co., Ltd.), Mr. R. G. Thomson (Clayton, Son, & Co., Ltd.), Capt. P. Fields-Clarke (British Mannesmann Tube Company, Ltd.), Mr. A. Dyson (Thos. Piggott & Co., Ltd.), Sir T. Harris Spencer (Spencer & Son, Ltd.), and Mr. F. Herbert (Stewarts & Lloyds, Ltd.).

The specification applies to lapwelded and weldless pipes and specials of nominal sizes from 2 in. to 72 in. inclusive; its requirements are applicable to pipes with flange joints, flexible joints, or the like, except with regard to the joint. It does not apply, however, to what are commercially known as gas, water, and steam tubes, which have screwed joints.

Four thicknesses are standardized for each size of pipe and the test pressures vary, according to the diameter and thickness, from 500 ft. head for the thinnest of the large diameter pipes to 2,300 ft. head for the smaller pipes. A special series of pipes which are interchangeable with cast-iron pipes to the British Standard Specification No. 78 is also standardized.

The actual shapes of the sockets have not been standardized, but for each type of joint dealt with the dimensions necessary to secure interchangeability and an adequate caulking space are laid down. The specials standardized are collars, bends, and tees.

The clauses of the specification deal comprehensively with the quality of the steel and the manner of taking samples for mechanical testing, workmanship, and tolerances on dimensions, while protection against corrosion is dealt with in sections providing for coating, external covering with hessian or asphalt, and lining with asphalt or concrete.

Copies of the specification (B.S.S. No. 534-1934) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W. 1, price 2s. 2d. post free.

Low-Temperature Carbonization in Scotland.

Writing in the British Industries Fair Supplement to the *Financial Times*, Mr. A. M. O'Brien gave an account of the recent activities of the Scottish Gas Utilities Corporation at Glenboig. He explained that the Corporation acquired in June, 1932, the plant and property of the Bussey Coal Distillation Company at Glenboig. They proceeded to alter and modify the retorts and the auxiliary plant to suit a pre-arranged scheme, finally bringing the plant to a productive stage in February, 1933.

Since that date, operation of the retorts has, stated Mr. O'Brien, continued without intermission. At present the Corporation is supplying for industrial purposes gas at the rate of 1,200 million c.ft. per annum, and 200 B.Th.U. heat value per c.ft. The gas before delivery is freed from all suspended or entrained tar oil by treatment in a Lodge-Cottrell plant.

"The Corporation," he continued, "have developed a method of treatment whereby the crude tar oil can be converted into an oil, perfectly limpid at many degrees below freezing point. Examination of this converted oil under the microscope shows it to be a homogeneous liquid, and the largest speck of opacity is not greater than 1-1,500th part of a millimetre in diameter. Such homogeneity and freedom from solid matter, together with the very low freezing point, renders the oil particularly suitable for engines of the cold-starting high-pressure injection type.

"The smokeless fuel marketed under the name of 'Heatbrite' is an ideal household fuel. It is very clean, and contains 95% of combustible matter. It lights as easily as a coal fire with paper and sticks, and burns with a steady, strong radiance, accompanied by a beautiful mauve coloured transparent flame,

"Reviewing low-temperature carbonization of coal by the process and methods of Scottish Gas Utilities Corporation, it appears they have solved the problem from an industrial and commercial standpoint. There is no doubt the low capital cost of a plant of the type used by Scottish Gas Utilities Corporation, combined with its low maintenance charges and extreme flexibility on load, has established beyond all reasonable doubt the economic treatment of coal by low-temperature carbonization methods for the production of better fuels, whether gaseous, liquid (spirit-tar oils, &c.), or solid smokeless fuel, to be definitely established."

Britain's Fuel Problems.

James Watt Anniversary Lecture.

Prof. W. A. Bone, D.Sc., F.R.S., of the Imperial College of Science and Technology, London, delivered the 67th James Watt Anniversary Lecture at a meeting of the Greenock Philosophical Society on March 2.

Prof. Bone's subject was "Britain's Fuel Problems" and he pointed out that from the industrial revolution of 1750 Britain had turned from an agricultural to an industrial country and that her strength depended on her iron and coal on which the allied industries, textiles, shipping, and engineering so largely depended.

Having thus subordinated her agricultural interests, said Prof. Bone, Britain could never turn back the wheel of destiny and return to an agricultural country. The only important raw materials which this country possessed were coal, clay, and salt, and so long as they could produce coal the raw materials of other countries would be attracted here. Our coal reserves need cause no anxiety as there were, within 4,000 ft. of the surface, 200,000 million tons of well-matured coal of low ash content and good variety. We possessed some of the finest steam, gas, and coking coals in the world.

Three causes were operative in the reduction of coal output. The first was the dislocation due to the war; the second was the replacement of coal by oil; and the third was the advancements which had been made in many processes and which had resulted in great fuel economy. Prof. Bone said that he considered the first to be evil and avoidable while the latter two were inevitable and would in the long run prove to be good.

Up to the beginning of the present century coal had been unchallenged as a fuel, but it had now been replaced by oil in a great many cases. The Navy had gone over entirely to oil, while a number of mercantile ships were also using this fuel, and railway companies were considering the use of diesel engines. The introduction of the internal combustion engine had not proved to be disadvantageous to the coal industry, as coal was used on the manufacturing side of the motor industry. There was little prospect of raw coal recovering trade from oil, as natural petroleum was so cheap that very little money could be spent on converting coal to oil which could compete with the natural product. For this reason low-temperature carbonization and hydrogenation of coal, while technically possible and highly successful, never seemed likely to be commercial successes. The greatest future hope of the coal industry seemed to be in the use of pulverized coal. Before this fuel could achieve complete success, however, the problem of de-ashing coal must be solved.

Prof. Bone then passed on to consider the third cause for the decrease in the output of coal. Improvements had been made in blast furnace design, and great fuel economy had resulted in the substitution of coke for coal. Great economies had also been effected in gas-works where modern processes had resulted in the greater make of good quality gas and the recovery of benzole. Prof. Bone in dealing with the prospects of oil, produced by hydrogenation of coal, competing with natural petroleum had commented on the recovery of benzole in gas-works. His opinion on this subject was that since the supply of natural petroleum was sufficient to meet our needs for at least another two centuries, and that the price of this product was not likely to rise, it would pay gas undertakings better to leave the benzole to enrich the gas. The progress which had been made in fuel economy must be maintained if British industry was to survive its present difficulties and hold its own against increasing world competition.

Comparative Working Results of the Three Metropolitan and Six of the Suburban Gas Companies

STATEMENT SHOWING THE WORKING RESULTS AND THE REVENUE ACCOUNT COSTS PER **THERM** SOLD FOR THE YEAR 1933

Compiled by Mr. F. J. Bradfield, General Manager and Secretary of the Commercial Gas Company

—	Gas Light and Coke.	S. Metropolitan.	Commercial.	S. Suburban.	Wandsworth.	Tottenham.	Croydon.	Lea Bridge.	Hornsey.
Declared calorific value, B.Th.U.	500	560	500	560	500	500	500	500	500
Gas sold on declared calorific value, therms	249,309,234	85,656,576*e*	16,853,690	24,074,668	27,499,235	19,085,827	14,913,269	5,130,480	3,893,133
Increase, p.ct.	Dec. 1·78*a*	Dec. 3·69*f*	Dec. 2·39	1·79	Dec. 1·19	0·29	Dec. 0·43	Dec. 1·27	Dec. 2·45
Gas made per ton coal on works tests, therms	75·65*b*	75·71	72·05	74·63	72·77	72·67	75·01	80·43	69·32
Gas unaccounted-for, p.ct.	4·32	0·07	3·40	7·00	4·15	5·96	7·34	4·34	1·50
Coke made for sale per ton coal, cwt.	9·77	9·45	9·99	9·45	8·39	9·80	10·33	10·42	10·92
Tar made per ton coal, galls.	10·66	10·50	9·60	9·87	9·51	11·30	13·86	15·75	12·10
Liquor made per ton coal, galls., 8 oz.	23·20	40·75	38·30	30·50	27·82	28·25	33·36	36·43	38·06
Percentage of coke used as fuel	20·30	20·33	23·11	25·53	29·39	22·98	19·90	21·37	16·00
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Capital expended (*less* nominal additions) per therm sold	2 0·01	1 7·86*g*	1 10·82	2 5·30	2 4·68	1 10·16	2 6·09	1 11·53	1 10·74
Capital employed per therm sold	3 4·42	2 3·85*g*	3 4 09	2 10·31	2 10·96	2 4·11*m*	2 11·08	2 0·94	2 5·31
	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.
Price of gas per therm in principal area (L'day, Mid.	8⅜ 8⅜	8⅝ 8⅝	9 9	9½ 9½	7⅜ 7⅜	8⅜ 8⅜	9 9	8⅝ 8⅝	8 8
Price of gas per therm in principal area (Michs., Xmas	8⅜ 8⅜	8¼ 8¼	9 9	9¼ 9½	8 8	8⅝ 8⅝	9 9	8⅝ 8⅝	8 8
Costs per Therm Sold.									
REVENUE ACCOUNTS.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Coals, oil, &c.	3·07	3·15	3·64	4·25	3·62	4·16	3·82	3·76	4·45
Less residuals—Coke and breeze	1·29	1·46	1·88	1·65	1·35	1·64	1·65	1·30	1·85
Tar	·42	·39	·53	·34	·35	·43	·62	·43	·37
Amm. liq. & sulph. amm.	·00	Dr. ·00	·06	Dr. ·02	Dr. ·02	Dr. ·02	Dr. ·01	·00	Dr. ·01
Total residuals	1·71	1·85	2·47	1·97	1·68	2·05	2·26	1·73	2·21
Net for coals, oil, &c.	1·36	1·30	1·17	2·28	1·94	2·11	1·56	2·03	2·24
MANUFACTURE—									
Salaries	·14	·23	·23	·19	·19	·19	·19	·08	·15
Wages—carbonizing	·33	·54	·64	·46	·37	·51	·28	·44	·47
Purification	·07	·15	·13	·12	·11	·10	·06	·06	·11
Repairs—plant	1·06	1·43	·96	1·05	1·68	1·65	1·29	1·50	1·09
Net manufacture	2·96	3·65	3·13	4·10	4·29	4·56	3·38	4·11	4·06
DISTRIBUTION—									
Wages and salaries	·65	·35	·36	·80	·47	·34	·53	·13	·31
Repairs—Mains and services, &c.	·99	·66	·48	·89	·71	1·37	1·11	·65	·58
,, Meters & prep. meters & fittings	·43	·83	·95	·89	·70	·52	·46	·49	·35
,, Stoves—ordinary & prepayment	1·04	·65	1·00	·64	·67	·49	·78	·81	·28
Total net manufacture & distribution	6·07	6·14	5·92	7·32	6·84	7·28	6·26	6·19	5·58
Rents, rates, and taxes	·70	·38	·50	·12	·27	·52	·58	·60	·44
MANAGEMENT—									
Directors, Auditors, and salaries (Secretary, &c.)	·11	·15	·21	·20	·19	·17	·23	·29	·37
Collectors	·20	·16	·27	·12	·12	·22	·25	·14	·08
Stationery and general charges	·16	·18	·25	·19	·23	·17	·25	·30	·23
Co-partnership	·10	·19	·19	·15	·23	·18	·21	·14	·14
Bad debts	·02	·01	·01	·02	·03	·01	·01	·01	·05
Law and parliamentary charges	·01	·00	·04	·06	·01	·00	·00	·01	·01
Superannuation, pension funds, &c.	·21	·26	·29	·41	·21	·19	·41	·34	·89
National Insurance	·07	·26*h*	·08	·07	·08	·09	·05	·06	·06
Sundries	·01	·01	·00	..	·01	..	·00	..	..
Total expenditure (*less* residuals)	7·66*c*	7·74	7·76	8·66	8·22*l*	8·83	8·25	8·08	7·85
GAS (*less* public lighting expenses)	7·99	8·10	8·33	9·10	8·14	8·52	8·93	8·11	7·89
Rentals—Meter & prep. meter & fittings	·87	·70	·70	·70	1·10	·52	·56	·46	·37
Stove	·66	·49	·62	·72	·63	1·36	·70	·98	·69
Incand. mantle maintenance	..	..	·01	..	..	..	..	..	..
Miscellaneous	·05	·02	·01	·01	·03	·03	·33	·00	·05
Total—Gas, rentals, &c.	9·57	9·31	9·67	10·53	9·90	10·43	10·52	9·55	9·00
Balance, being profit	1·91	1·57	1·91	1·87	1·68	1·60	2·27	1·47	1·15
Dividend and interest	1·93	1·57	1·98	1·83	1·89	1·56	2·17	1·44	1·41
Surplus or deficit	Def. ·02	Def. ·00	Def. ·07	·04	Def. ·21	·04	·10	·03	Def. ·26
Contributions to funds and sundry payments	·01*d*	..	..	·20	Cr. ·07	·07	·10	..	..
SUNDRIES.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Coals cost per ton	20 2·45	19 6·13	20 5·70	23 7·10	22 0·89	25 3·80	24 8·07	27 1·59	27 1·00
Coke realized per ton coal	9 1·36	8 10·12	10 4·35	10 4·30	8 5·59	10 4·85	11 5·97	..	13 4·67
Coke ,, ,, ,, coke	18 8·00	19 3·64	21 6·17	22 4·29	20 2·31	21 2·91	22 3·20	23 5·76	24 6·27
Breeze ,, per ton	3 11·33	1 11·19	4 5·03	0 2·71	6 11·98	5 10·02	5 9·19	..	..
Tar ,, per gallon	0 3·50	0 2·79	0 3·74	0 2·63	0 2·73	0 3·09	0 3·66	0 2·79	0 2·54
Amm. liquor, &c., realized per butt, 8 oz.	0 0·61	Dr. 0·46	0 11·35	Dr. 5·47	Dr. 6·60	Dr. 7·37	Dr. 3·93	0 0·15	Dr. 3·20
Percentage of stoves at rental to consumers	97	112	102	96	71	81	74	68	36
Bad debts p.ct. on total receipts	·18	·12	·09	·13	·29	·05	·12	·10	·43
Net profit p.ct. on ordinary capital	5·48	5·99	5·50*j*	6·20*k*	5·18*l*	7·04	9·44	8·73	4·58
One-fifth penny variation equals gross	£194,947*a*	£86,359*i*	£17,147*i*	£24,605*i*	£21,986*a*	£15,905	£12,428	£4,275	£3,244
Water gas p.ct. on total make of c.ft.	21·94	..	..	..	17·62	22·53	26·69	32·27	30·88

a—On gas charged to consumers.
b—Before benzole extraction.
c—Excluding Leigh loans (repaid).
d—*Less* grant from Treasury.
e—Including sales to South Suburban.
f—Excluding sales to South Suburban.
g—Eliminating purchase of South Suburban and Commercial stocks.
h—Including co-partnership insurance fund.
i—One farthing variation on gas charged.
j—Excluding stamp duty.
k—Excluding compensation *re* Sevenoaks and Tonbridge Companies.
l—Excluding capital duty.
m—Including investments in other Gas Companies.

JOINT GAS CONFERENCE AT THE FAIR

Delegates from all parts of the country were present at the Joint Gas Conference, opened under the Chairmanship of Sir FRANCIS GOODENOUGH, at the British Industries Fair at Castle Bromwich on Feb. 27. The gathering was held under the auspices of the Institution of Gas Engineers, the Society of British Gas Industries, the British Commercial Gas Association, the National Gas Council, and the Gas Companies' Protection Association.

The Lord Mayor of Birmingham (Alderman H. E. Goodby) was unable to be present owing to indisposition, and a civic welcome was given to the delegates by the DEPUTY-MAYOR (Alderman J. B. Burman), who said that Birmingham was very proud of its Gas Undertaking. The Department, in spite of competition from another industry, continued to progress. It was very proper that the Conference should be held in Birmingham, and doubly appropriate that it should be held at the British Industries Fair, because gas was essentially a British Industry. It was founded on British coal, than which there was none better in the world. The works were equipped with British plant and the gas produced was distributed through British-made pipelines. Furthermore, it was consumed in British-made appliances; and last but not least it was financed entirely by British capital. Alderman Burman referred to the optimistic outlook of Sir David Milne-Watson, which was symptomatic of the attitude throughout the Industry. He gave the delegates a cordial welcome on behalf of the city and expressed the hope that the Conference would be a valuable one.

Sir FRANCIS GOODENOUGH thanked the Deputy-Mayor for his cordial welcome. He said they were very glad to be in Birmingham again and to see gas represented at the Fair in so thorough and comprehensive a way. They in the Gas Industry were proud of the Birmingham Gas Department and its General Manager, Mr. A. W. Smith, whom they were glad to see present. If every municipal enterprise in the world had been as well conducted and as efficiently operated as the Birmingham Gas Department, municipal trading would have gone a great deal further than it had in this country. They were sorry the Lord Mayor was ill, and they would desire to send their sympathy and best wishes for a speedy recovery.

A welcome was also given by Mr. C. E. GREENER on behalf of the Fair Authorities.

PRESIDENTIAL ADDRESS

By Sir FRANCIS GOODENOUGH, C.B.E., Executive Chairman of the British Commercial Gas Association.

What is the subject most in the minds of the Gas Industry to-day?

That was the question I asked myself when thinking about what I should take as the subject for my opening address to this national conference; and it seemed to me that the subject that has been and is at present occupying our minds most constantly is: The attitude towards us of our greatest though not our only competitor, the electrical industry; and what our attitude should be towards that competition and what new steps, if any, we ought to be taking to meet it now and in the next few years.

I say " the next few years " because it is, I think, obvious to everybody that during the interval between the completion, recently, of the great electrical grid and the date when the capital charges arising out of the cost of the grid will have to be met out of revenue—*i.e.*, out of the price of electricity—instead of being, as at present, carried to capital and so not met by the customer—it is, I say, obvious that during that rather indeterminate interval of something over two years the electricity supply industry, and especially the Central Electricity Board, will make the most strenuous efforts to increase the quantity of electricity sold in order to have a larger number of units over which to spread the capital charges when they have to be borne.

It is obvious from all the statements of electricians and their trade papers that they are pinning their hopes of such increased sales of current on the capture of business from the gas undertakings of the country, and for that purpose the British Electrical Development Association has recently been re-organized and Sir William Ray has been appointed its Executive Chairman. Undoubtedly we of the Gas Industry in general, and of the British Commercial Gas Association in particular, are not going to let those hopes be fulfilled if we can help it.

What are the prospects for the Gas Industry? What steps have the gas undertakings of the country and their national organizations to take in order to safeguard their interests and improve their prospects?

My first observation in reply to those questions is that there are no grounds for serious apprehension on the part of those engaged or financially interested in the Gas Industry, provided that realities are faced by everybody and certain conditions are fulfilled. There is no more ground to-day for fears as to the future of the Gas Industry than there was 50 years ago when first its doom at the hands of the then newly-born competitor, electricity, was foretold, and nervous gas shareholders sold their holdings to those with better knowledge, better foresight, and steadier nerves. In my carefully considered judgment, the prospects of the Gas Industry to-day are brighter than ever; and I believe it will show greater expansion during the next 25 years than during the past quarter of a century. Is that merely the cheerful optimism which ignores difficulties; is it a whistling to keep up one's courage; or have I reasons for my faith?

You cannot build up a stable and progressive business on untenable claims, unsubstantiable innuendoes, or faked evidence. And in my judgment it is better to leave those who try to do so to suffer the blows to their prestige and reputation of the surely returning boomerangs than to attempt any retaliation in kind. The policy of stating honestly, clearly, and convincingly the arguments in favour of your own commodity or service and meeting libels or slanders uttered against you by a simple statement of demonstrable truth is, I believe, the truly profitable policy for any man or any corporate body engaged in trading—especially in any British Community. It will earn you the lasting respect and custom of the public—which does not like being " fooled " for any part of the time.

Satisfactory goods *plus* efficient service, adequately advertised, and competently presented by salespeople thoroughly and soundly trained, not only in the technics of the goods but in the technique of selling, are the essentials to permanent progressive profit-making. Let us gas administrators all get that firmly into our minds and determine to leave no stone unturned to make our service and our staff satisfactory and competent beyond a peradventure, before we hoist the flag of optimism and faith.

But what of the municipal public utility that is not concerned with making profit for shareholders and is owned by an authority that also owns the rival utility of electric supply? Are those factors essential to them? Why should gas be advertised where its competitor—electricity—is owned by the same corporation?

I submit that the advertising of the potential services of public utilities is not a matter of competition, not one of commercial policy; it is a matter of public duty.

Let me quote here, in support and explanation of that statement, something that the late Sir Corbet Woodall said in his Presidential Address to the first Annual Conference of the British Commercial Gas Association at Manchester in 1912:

Why Municipalities Should Advertise.

" In the case of some undertakings, it is necessary first of all to persuade the administrators that any expenditure upon publicity is necessary. Their enterprises have paid dividends or contributed to the relief of the rates in the past without any money having been spent on publicity. Why is any such expenditure called for now?

" My answer to that question is this: Parliament has given your undertaking a monopoly-right to supply gas in your district. Whether you are a sliding-scale company, or a maximum-dividend company, or a municipal undertaking, the public rights you possess impose upon you a public duty—that of supplying gas in your district at the lowest possible price consonant with your other obligations. You can only supply gas at the lowest price possible in your district by selling as much in that district as can be advantageously used by everyone living or doing business in the district. You can only sell the possible maximum quantity of gas in your district by ' making known as widely as possible the truth concerning all the possible uses and advantages of the commodity and the reasons why it will be to the advantage, both ultimate and immediate, of the public to purchase the commodity '—*i.e.*, by spending money on publicity.

Local v. National Effort?

" This argument also has to be met: ' Why should we not spend all that we can afford to spend on our own local publicity work? ' The answer to that argument—a conclusive answer it appears to me—is this: You can ' afford ' to spend and ought to spend on local

publicity work every penny that will produce a profitable return—neither less nor more.

"The Association can help you to do all the local work that requires to be done far more economically than you can do it without the aid of co-operation. This has been clearly demonstrated already by the experience of many of the subscribing undertakings; and it is a cogent argument in favour of every undertaking becoming a subscriber. It is not a question of alternatives but of complements. National publicity is complementary to local publicity, and local to national. Neither is complete without the other; each increases the value of the other."

Public Utilities as Complementary Services.

I believe that that perfectly sound argument has led in the past and will lead in the future to very many municipal authorities being convinced supporters of the British Commercial Gas Association. I hope it will lead to even more ready and more full support in the future by all our municipal (and indeed all our Company) members. It is not a question of public utilities playing the part of Kilkenny cats, but of their acting as co-operative public servants out to increase, as the widespread usage of gas and electricity can increase, the amenities, the sunshine, the health, the attractiveness, and the productive capacity of the towns and cities they exist to serve.

If I may use an expressive Americanism, the propaganda for electricity that we meet frequently—propaganda put over very often by politicians and earnest social workers—needs very much to be "de-bunked," to have, that is to say, a lot of fanciful bunkum squeezed out of it and replaced by commonsense and realities.

"Man Never Is."

Many of those earnest people who prattle about the coming "electric age"—that age that has been coming ever since I was a boy at school; during which long period it has been a continuing case of "man never is, but always to be, blessed"—these dear people talk for all the world as if gas had done nothing to alleviate the housewife's drudgery, bring safe and effective lighting into the home, lighten the skies of our cities, and ameliorate the conditions of our furnace-operators and other factory hands. They ignore the wonderful domestic revolution effected in millions of artisans' homes (and in the public health) by the penny-in-the-slot gas meter, the gas cooker, affectionately known throughout nearly 5 million homes in these islands as "mother's third hand," the gas fire, the gas wash-copper, and the incandescent gas burner; and they speak as if the salvation of the race awaited the advent of electricity, while the woman in the kitchen and in the washhouse and the children at their lessons in the parlour are already consciously or unconsciously echoing the slogan: "Thank Goodness for Gas."

Vital to Our Future.

The wealth and the health of the British Isles alike depend upon the wise utilization of their coal resources. While opinions differ on the question of the future ownership and management of our coalfields, no one questions the fact that the conservation (the efficient utilization) of the coal that still lies beneath our feet is vital to our industrial future.

Our national prosperity—our very existence as an industrial power—depends absolutely on the efficient production, transport, and utilization of our coal resources, coupled with our supplies of iron.

The problem is not merely: How long will the coal in our coalfields last at the present—or even at an increased—rate of consumption? It is: *How long can we win that coal and deliver it to the user at a price that will enable our industries to compete with those of America, Germany, France, and Japan?*

Do not let us forget that, while past reports may have lulled us to sleep with news that we have as yet beneath our feet 200,000 million tons of coal, the United States have 4,000,000 million tons of coal, Canada has 1,000,000 million tons, and Germany has 400,000 million tons. Moreover, Germany uses little more than half, while the United States do not use double, the amount of coal that we take from our mines annually.

Waste is eliminated when coal is transformed at the gas-works into light, heat, and power, as well as into bye-products of immense national benefit.

The two objectives, coal conservation and smoke abatement, happily go hand-in-hand. Both are to be achieved by the same means, and by one means only—the carbonization of our coal.

Carbonization, moreover, while serving these national ends, serves also the ends of individual fuel consumers. It can provide them with a labour-eliminating fuel—Gas—which is without superior for an enormous and expanding range of industrial and domestic purposes, and is entirely satisfactory from the consumer's standpoint—particularly when the consumer is alive to the economic importance of other factors than mere fuel costs; and with a solid fuel—Coke—that is the cheapest to be obtained.

Electricity, while having a great and promising field of usefulness in the service of man, outside that occupied by the Gas Industry, cannot be used in this country as a source of heat except at a cost in coal to the nation and in money to the consumer that cannot be entertained by a practical people.

The use of electricity for lighting is also strictly limited by considerations of cost. Gas holds the field and will continue to hold the field of artificial illumination wherever—and that is in many directions—economy and reliability are primary considerations.

These are the facts which we of the Gas Industry mean to do all in our power to make clear to the people of this country. There need be, and should be, no acrimonious disputation between us and our competitors. Let us both state the truth, the whole truth, and nothing but the truth before the jury of the nation, reserving to ourselves always the right to rebut unfair and untruthful evidence; let the powers that be—governmental and municipal alike—give us a fair field and no favour; and I, for one, have no fear of the result. Our great home product—Coal—put through the processes of high-temperature carbonization at our gas-works will, in the future as in the past, prove the mainstay of our national wealth and provide Health, Comfort, and Economy in home and factory.

British Coal, through British Works and British Workers, is Britain's Fuel and Britain's Wealth.

I submit, indeed, that all that I have said about the necessity of making sure that our service and our publicity, our vigilance and our activity are modern and effective beyond reproach, alike as regards every individual undertaking, and all our national organizations, though familiar enough, cannot be too often repeated and insisted upon and coupled, as I wish to couple it here and now, with an earnest appeal for further and larger support for those national institutions.

We have all to realize, and continually to remind ourselves, in the Gas Industry, as in all branches of British trade and industry, that *modern days demand modern ways*—and that we must not content ourselves—either individually or collectively—with satisfaction at past achievements, but must determine to win, as we can and shall win, fresh laurels in the future through activity, initiative, and courage, and so ensure the continuing and progressive prosperity of the great public service in which we are all engaged and have undiminished faith and ever-growing interest and pride.

VOTE OF THANKS.

Sir RUSSELL BENCRAFT proposed a vote of thanks to Sir Francis for his address. They were all very glad to see Sir Francis back again in good health. He had been a tremendous asset to the Industry and they hoped he would be spared for many years to carry on the activities he had engaged in on behalf of the Industry.

Col. W. M. CARR (Stretford) seconded. He, too, said it was a pleasure to see that Sir Francis had been restored to health. They had looked to him for many years for leadership on the publicity side. Each one of them had belief in the Industry, but he thought it had been the fault of all of them that they had been too modest in keeping their faith to themselves. He knew that in his own small way of business he met people every day whom one might think knew all about gas, but one found they had not the slightest conception of its possibilities.

Sir FRANCIS GOODENOUGH thanked the delegates for their personal interest.

MESSAGE FROM AUSTRALIA.

Lt.-Col. Woodall, who is in Australia, sent the following message to the Conference:

> Please convey to the Joint Gas Conference all good wishes for a successful meeting and for the prosperity of the Gas Industry.

LUNCHEON SPEECHES.

The chair at luncheon was taken by Sir FRANCIS GOODENOUGH.

The toast of "The Gas Industry" was proposed by the EARL OF DUDLEY, who said that one of the most significant facts about the trend of opinion to-day on the important question of fuel utilization was the view that coal must be regarded, in future, less as a fuel for immediate consumption than as raw material for other products.

More and more they were realizing that the best way—indeed, the only certain way—of restoring prosperity to the

mining industry, upon which the general prosperity of the country so largely depended, was through the scientific use of coal. This view had undoubtedly largely been brought home to them by the stimulating example of the Gas Industry and the progressive spirit of its leaders. No finer object lesson to all fuel-using industries could be instanced than this great and expanding Industry. No other industry could claim to be ahead of it in making use of all the advantages of applied scientific research.

From its earliest inception the Gas Industry had fostered and encouraged every research designed to lead to a more economical use of its raw material, coal, and to a wider and more useful application of its primary product and its many bye-products.

As manufacturers realized more clearly the immense possibilities of gaseous fuel for industrial processes requiring heat, there would be a vast extension of the industrial sales of gas, and a consequent increase in the amount of coal purchased by the gas undertakings. Instances could be quoted where a change-over from solid fuel or oil to gas had led not only to improvements in production, but to decreased production costs as well.

At the other end of the scale were the many homely uses to which gas had been put. By providing smoke-free and labour-saving appliances for cooking, water heating, room warming, and home laundry and refrigeration, the Gas Industry was working towards a happier and healthier community under cleaner skies.

There were, too, many public services performed by the Gas Industry which must not be forgotten. Gas was originally used for lighting, and to-day lighted the majority of our streets. All over the country new contracts were being made between lighting authorities and their gas undertakings for street lighting—a tribute to the way gas had been brought up-to-date to meet the immense growth in road traffic requirements in this century.

Competition from Oil.

"One of the reasons given for the decreased demand for coal to-day," continued Lord Dudley, "is the competition of imported oil. It is true that in certain directions oil has even created some new demand for coal, but there is no doubt that its displacements of our home-produced fuel are far more heavy and that, unless this competition can be met, they will be proportionately heavier in the future. The duty on fuel oil imposed by the Government last year was an attempt to deal with the situation, and I think it can be claimed that this tax has already had results beneficial to the mining industry and to those fuel industries related to it.

"The work done by foreign oil can in almost every case be carried out equally well by gas. For central heating gas or gas coke can replace oil-fired installations with benefit to the output of coal. For water heating or industrial heating processes oil should also give way to a home-produced fuel like gas, which has the advantage over its competitor of greater cleanliness and simplicity of working.

"The duty on oil will also give a valuable stimulus to the experiments proceeding in the use of gas and oils derived from British coal for the running of motor vehicles. As a result of exhaustive experiments in various towns, a number of commercial vehicles are to-day running successfully and at a considerably less cost than on petrol on compressed gas. The first public filling station for gas-driven motor vehicles has been opened at Chesterfield, and it would appear that there is an important future for this new application of gas.

"From the point of view of the coal industry it is, I think, of great importance that the Gas Industry should be free to develop its business on its own lines. The Gas Industry is one of the most highly organized industries in the country. The whole section of the Fair devoted to the products of the Gas Industry is a striking tribute to the progressive spirit that obtains in this great national Industry."

The Chairman briefly responded.

Mr. H. E. Bennet (Chairman of the Society of British Gas Industries) submitted the toast of "The Guests."

Mr. Reginald Clarry, M.P., in responding, said that in the last few years there had been a great change in the outlook in Parliament towards gas and the Gas Industry. They found prominent men throughout the country saying that gas was the way towards national prosperity. Evidence of the great strides which were being made was to be found in the increased activities now in Parliament of the electrical and oil industries. They now worked for political favour, whereas formerly they thought it was a plum which would fall into their mouths. He believed this was the only conference held during the year in which every interest in the Gas Industry met together. He thought it would facilitate matters very much if in addition to keeping a national and united front they would also take more interest in their own local government and affairs, and so deal at their inception with things which now had to be dealt with nationally. With some knowledge of the Gas Industry, he felt that some of them were not taking the interest they might in local affairs. Finally, he wished increased prosperity and an ever-widening sphere of usefulness to the Industry.

THE GAS INDUSTRY*

By E. W. Smith, C.B.E., D.Sc., F.I.C.

When I was asked to give this paper at the British Industries Fair, I felt that there was a great deal that could be said which might help those outside the Gas Industry to get a better perspective of its history and future position than so far seemed to be available. Since then, however, so much has been written and said at company meetings and otherwise, that in writing this paper I feel a little disconcerted in that there is very little fresh that can be put before you.

However I shall do my best to give you my views on the present status of the Gas Industry and what it means to the community, and secondly my feelings as regards the competition which we are up against from other forms of fuel and energy, and thirdly endeavour to picture the possibilities of future development which will enable the Industry to make still further strides in satisfying the national requirements for heat.

I believe the Gas Industry to be one of the key industries in our national life. I believe its operations have an influence, domestically and industrially, which is unparalleled in other industries in its comprehensiveness and importance.

We are occasionally spoken of as a dying Industry. Even responsible men, leaders of competing industries, speak of it as an Industry that can, with a little energy and trouble, be wiped out. This constantly reiterated attitude cannot help but have had an effect, not only on prospective consumers, but on the personnel of our own Industry.

What are the facts? It would be foolish to suggest that any one form of fuel or heat, whether it be coal, coke, gas, oil, or electricity, could ever become a universal form. Technically it might be so, but commercially and economically it never will be so. If every alternative were given an equal chance, and treated efficiently, both by Municipal Authorities and by the Government, then a state of approximate equilibrium would be set up when each form would have its application, and the state of equilibrium would merely be varied or altered by changes in economic values and technical requirements.

We must recognize that there is a place and a function for all forms of fuel. We must also recognize that when coal was the primary fuel used, it was because there were few alternatives. As soon as other forms became available each could show advantages, and the direct use of coal was reduced. If gas and coal had been available and developed together over 100 years ago there would be much less coal used to-day. The same thing applies to electricity and oil. It is inevitable that there will be certain large uses of both these sources of energy which both gas and coal have so far felt to be their main preserves. Some of these have been and will have to be released. The danger is that the mere existence of these alternative forms should be taken by the Gas Industry as a *sine quâ non* that gas will be displaced by them. Only by a hard fight between the various forms of fuel will the truth be attained.

An Inferiority Complex.

It is regrettable to have to acknowledge that a part of the personnel of the Gas Industry is suffering to-day from a sort of inferiority complex. This certainly does not apply to the big majority of those engaged in our Industry, but a small leaven of defeatists is a very enervating constituent within our ranks, and the more we develop sound knowledge and a clear conception of our position, the sooner they will develop a restrained optimism based on a faith in the Industry with which they are connected.

Much of the bounce and bluster of the other side and the inaccurate statements are like a man whistling in the dark to keep his courage up. I say this advisedly, because if there is any intelligence on the other side, and any knowledge of our Industry on the other side, they must know that the foundations of our Industry and its developments are so fundamentally sound that left to itself to develop unhampered and to achieve the results which are justified on economic and technical grounds there is nothing that can stop the future advancement of the use of gas and

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developments in the carbonization of coal for the national good.

I believe that we have the ball at our feet, and that with courage, unselfishness, and a playing for the team there is nothing can stop the achievement of a success within our Industry which has been undreamt of in recent years.

If I give some facts and figures to support my contentions I must be excused from quoting statistics which may already be well known to most of you.

If the Gas Industry were to be wiped out to-morrow, and even if alternatives were readily at hand to take its place, there are no alternatives which could serve the community as a whole nearly so well as the Gas Industry. The mining industry itself is dependent on the carbonizing industry. There are about 36,000,000 tons of coal used annually within these industries. This corresponds to approximately the employment of 140,000 miners, and helps to keep over 500,000 of our population. At the same time the Gas Industry employs directly within the Industry over 115,000 people, which corresponds again to over 400,000 of the population of our country.

Apart from these figures there are all the industries which are dependent on the Gas Industry. There are the firms that make gas fires and gas cookers, the firms who build carbonizing plants, the firebrick and the silica brick works, the steel works and the foundries, the brass works and the tube works, the suppliers of lubricating oil, of oxide and sulphuric acid, the makers of fittings, and the like, too numerous to mention.

Value to the Community.

It would appear that not only do the public take the Gas Industry for granted, but that many in our own Industry have unconsciously developed a similar attitude. This is probably largely due to its long history, to the fact that it gives no trouble. We have good labour conditions, and therefore few strikes, and the products it supplies meet the entire requirements of the man in the street. Its ramifications are too complex and too technical to be grasped by the ordinary individual. Its interests are too diverse to have an immediate appeal to the ordinary individual. Electricity being a much newer development, and having an application to such things as wireless and lighting, and motors, and being of a more mysterious origin, does make an appeal.

When from an economic point of view it is realized that apart from the explanation as to what is electricity the whole subject is one bound up with a very simple and straightforward industry, and that coal is converted into steam and steam to electricity, there are no bye-products, the only product of the industry being electricity, those who think more deeply will appreciate how much more the Gas Industry means to the community than does electricity.

I do not wish to be misunderstood, however. I believe electricity is an essential part of any modern civilization. It has its place and it can do some things better and cheaper than gas. That does not mean to say, however, that electricity ought to be universally applied in all those directions in which gas has so far held the field. There is plenty of room for both industries. That is shown by the fact that on the Continent and in the United States even, where electricity is being used much more extensively than is the case in this country, its development has been accompanied by a like development in the use of gas.

Those of us who are in the Industry know that the primary object of the Gas Industry is to produce cheap gas. In order to do this there are produced at the same time other products which are of just as much importance to the community as gas itself. If no gas were produced the community would be deprived of 7,000,000 tons of coke sold annually for domestic and industrial purposes. This type of fuel would not be used in these quantities if it were not economically and technically sound to do so. Coke, as made to-day, has found its level to the extent I have indicated.

On the other hand, the Industry is making increased quantities of benzole for motor spirit and other purposes. Of the 32,000,000 gallons made by the carbonizing industries the Gas Industry is responsible for over 7,000,000, and there is no reason whatever why this quantity should not be doubled. This is a home produced motor spirit made from British coal, which in later years may be a remarkable insurance in times of trouble. By the production of motor spirit we ensure the immediate availability of raw materials for high explosives. But for the British Gas Industry it is doubtful whether the Allies could have continued the war as long as they did.

One must not overlook, too, the importance of tar. It is the sole source of many drugs and medicines, scents, disinfectants, and the like, and without tar these products would never have been as available as they are to-day. But apart from these finer products, one would not care to visualize either the state of our roads or the cost of upkeep without the use of proper tar. This is a development that has taken place during the last thirty years which has completely revolutionized the amenities of our roads, and it is not an exaggeration to say that but for the use of tar, and in view of the present-day motor traffic, pleasuring by motor would be impossible.

Another product which is frequently overlooked but which is obtained in large quantities from the Gas Industry is sulphur. From the 17,000,000 tons of coal carbonized there is extracted annually about 80,000 tons of sulphur. This is largely used in the production of sulphuric acid, which is one of the major of the heavy industries of this country.

Improvement in Appliances.

But gas itself has the most important bearing on the activities of the community. It is significant that, although the actual output of gas for the last 12 months has not increased in a number of undertakings, the actual amount of apparatus, such as gas fires, gas cookers, and water heaters, that has been sold is very much on the increase. There is no doubt that during the last few years gas burning equipment has been very much improved, not only in appearance, but in actual efficiency. Many gas undertakings have adopted the policy of more rapidly changing old equipment for new, and this must have had a very material bearing on the gas output. Apart from this, last year was a very mild one, and so far as gas heating is concerned this must have been affected. The changing habits of the community, too, must have a bearing on the heat requirements, both for cooking and house warming. People are spending much more time out of doors motoring, and for other pleasures. Nevertheless, as I have stated, the amount of new equipment that is being installed by most gas undertakings is very much on the increase. Over 90% of our houses use gas for cooking where gas is available. Central heating and semi-central heating is on the increase, and gas is being used as an added fillip to the temperatures attained with semi-central heating. Gas is being more and more used for hot water heating, either through the geyser or through the storage system. It is convenient, flexible, and clean, having all the advantages of electricity, none of its disadvantages, and costing considerably less.

As a source of heat, gas is incomparably better than electricity, and is usually many times cheaper. Too little stress is laid by gas people on the matter of ventilation. Most of the objections to other forms of fuel than coal can be accredited to lack of ventilation. Properly installed gas fires provide ample ventilation in living rooms.

In spite of the attack that has been made on gas lighting by electricity, gas is still the chief form of illuminant, for domestic, industrial, and street lighting. The most satisfactory lighting, and certainly the cheapest in the world is still by gas. The Victoria Square, Birmingham, the best lighted public place in the world, was the pioneer in this respect. It is little realized that Whitehall and many of the leading thoroughfares in London are lit solely by gas, and that comparable streets in Paris and Berlin are also lit by gas. Gas undertakings are still receiving important contracts for miles of new street lighting. It is only to be expected that from time to time contracts will be lost. There will be change-overs both ways, the decision depending on price, predilection, vested interests, and salesmanship.

The chief advantages of gas for lighting for domestic use, so far as the bulk of the population is concerned, is that it not only gives a better form of light at a lower cost, but it also assists in the heating of rooms. Naked electric lighting is, in my opinion, definitely detrimental to the eyesight, and any means that may be employed to neutralize this defect have the effect of reducing the efficiency of light, in other words more light has to be used, and therefore it will cost correspondingly more.

At this point I should like to elaborate a little on the question of the national advantage in continuing to use gas for most purposes in preference to electricity.

In its production gas is only one of the many products obtained from the treatment of coal. All the others are of national value. In the production of electricity we have a one product process—electricity—if we accept the fact that the ashes from the coal have to be disposed of. Another factor of national importance is that 83% of the coal used in gas manufacture is saleable in the form of its products in the heat form, whereas the average utilization of the coal mined when converted into electricity is to-day no higher than 12%, the most recent stations having an efficiency of something approaching 22%. The man in the street may ask, can the country afford electricity? I personally think it certainly can, subject to its not displacing gas in any material way. It is a luxury so far as heating and lighting are concerned, but the community can afford

luxuries within certain limits, and under certain conditions. It is entirely a matter of degree.

The Factor of Safety.

Another great advantage which gas has over electricity is in its reliability and its flexibility. Failures of gas supply are practically unheard of, whereas we become so used to failures in the electric supply that the ordinary consumer to-day is getting into the habit of keeping a stock of candles or oil lamps available, and many places of entertainment have gas as a standby.

The Gas Industry does not believe in super-power stations. They know that the small saving in cost of production at the larger stations is very soon wiped out by the increased costs of distribution. They know that it costs more to distribute gas long distances than it does to distribute coal. I believe, too, that the insurance risks are greater with electricity than with gas.

Then from the financier's point of view it is interesting to note that for every £100 of capital expended in electricity undertakings there is about eight times as much capital required as is the case in the Gas Industry compared on equal thermal outputs. One also ought to visualize what would be entailed if the electrical industry were to make any serious inroads into the business of the Gas Industry. At the present time, expressed on an energy basis, there is five times as much energy sold in the form of gas by the Gas Industry as is sold in the form of electricity by the electrical industry. If one were to add the heating value of the coke and tar this figure could be multiplied by three. As regards the number of consumers, there are twice as many people in the country using gas as there are electricity.

In considering the question of thermal efficiency, in which I indicated that the Gas Industry was seven times more efficient in the production of its products, one is led to consider the costs of production of both gas and electricity.

Costs of Production.

The official returns for the country indicate that electricity is being produced to-day at a cost of about 8·3d. per therm, whereas the average cost of producing gas is 4d. per therm. If we consider the selling price, however, of these products, we find that the average selling price of electricity is about 40d. per therm, whereas the average selling price of gas is about 8d. per therm, electricity costing on the average five times as much as gas for an equal amount of energy sold.

From these figures it will be seen that 79% of the selling price of electricity is swallowed up in distribution and capital charges, whereas only 50% of the selling price is swallowed up on this account so far as gas is concerned. If, on the other hand, we compare electricity with coke for central heating, or for water heating generally, we find that with coke at 30s. a ton and electricity at ¾d. per unit, allowing for the differences in efficiency of utilization, electricity is approximately ten times as costly as coke.

Another matter of very great importance is the question of the pollution of the atmosphere. To-day over 75% of the gas that is sold is made in either continuous vertical retorts or in water gas plants. These are practically smokeless in operation. On the other hand, it is notorious that if one goes about the country one is struck by the fact that many of the chimneys attached to electric supply stations are constantly belching forth smoke. This is not the only defect. The coal from which gas and electricity is made contains approximately 1% of sulphur. In the production of electricity the bulk of this sulphur is burnt to sulphurous acid, and passes into the atmosphere, whereas in the production of gas the whole of the sulphur which is found in the crude gas is extracted as sulphur, and sold, with the exception of about 1%. It is known that on at least two of the latest super power stations expensive means have been adopted for extracting the sulphur from the stack gases before they enter the atmosphere. This process has not been working long enough to demonstrate its economic or technical practicability. It is to be hoped it will be successful.

One of the greatest evils that Great Britain suffers from to-day is due to the emission of smoke to the atmosphere. No other country in the world permits such a state of things. Conditions, however, are much better to-day than they were thirty years ago, and this is largely due to the change in the habits of the people, and particularly to the increased use of gas and coke for cooking and heating.

I do not intend to go into any detailed criticism of the use of electricity for cooking and heating. Such use will eventually find its own economic, technical, and hygienic level. We have nothing to fear in the long run, as an Industry, in this direction. The chief disadvantage the Gas Industry is suffering to-day in this competition with electricity is in finding the scales weighted against us, due to differences in legislative Acts, differences in government control, and the inequalities brought about through the *ex parte* support given the electrical undertakings by local authorities. It is only to be expected that, when a trading undertaking is under the control of municipal authorities, those authorities will push the sale of their product to the exclusion if possible of those products supplied by private enterprise. It is very doubtful whether it is for the national good that any but monopolistic enterprises should be under the control of municipal authorities. They should not have charge of the production and sale of products which are in direct competition with alternative products.

I believe that the organization of the Gas Industry, or rather its re-organization, could be much more readily effected if there were no such things as municipally owned gas undertakings. I do not intend it to be understood that I feel that municipally owned undertakings are less efficiently run than company owned undertakings. This is far from being the case.

I think I have said enough to indicate that the Gas Industry is established on sound foundations and is fundamental to the future development of the country. I have said nothing about the application of gas to industry. That I propose to deal with later.

What of the Future?

The Gas Industry has been successful up to date, and I see no reason why it should not be very much more so in the future. I believe that we must change our perspective, and look on the Gas Industry more as a chemical industry whose primary object is to produce the fuel required for domestic use and industry, and not just gas. I should like to see a Ministry of Fuel established which would co-ordinate and regularize all matters relating to the production and distribution and use of coal, gas, coke, and electricity. The Ministry of Mines, the Electrical Commissioners, and the Gas Section of the Board of Trade would be placed under its wing, and presumably given fair treatment. I would like to see a better getting-together of the individual units of the Industry. The Industry should be looked on as one, and not as an aggregation of individual units, although the finance and organization of the individual units would remain broadly as now, each autonomous within agreed limits.

I think it would be of advantage if the whole of the organizations which at present exist in the Industry were to be comprehensively reviewed. Each organization—the Institution of Gas Engineers, the National Gas Council, and the British Commercial Gas Association—has served the Industry well, but I feel that their co-ordination leaves much to be desired. We have too many meetings, and too few decisions. I think it is all to the good that gas undertakings are coalescing, but this should not be done in a haphazard way merely for the sake of size, and the sole consideration should be increased efficiency, reduced costs, and improved commercial convenience.

While I believe that the electricity grid as at present conceived is the result of an unfortunate ramp, and cannot help but be a millstone round the development of the electrical industry, I believe in gas grids, well developed, in numerous units which will be linked up as and when such linkages are commercially justified. This is taking place through amalgamations and otherwise in many parts of the country. Such amalgamations, however, should not be the result of their exploitation by outside financial interests.

The future of the Gas Industry depends to my mind on three fundamental considerations:

1. The further development of a sound policy for the Industry as a whole and its application to the individual units.
2. The continued development of sound salesmanship.
3. The development of a new technique, and therefore new markets for our products.

Dealing with the last of these points, I believe there is unlimited scope. A time may come when we shall find that we can profitably convert our gas into saleable products of various kinds in the larger undertakings, and the gas for sale may become a secondary question. Such processes will have the effect of filling up the troughs in the output curves, and flattening the peaks. Supposing a process could be found for converting coal gas, for instance, into solid or liquid products for which there is a large demand, more profitable than the sale of coal gas, then the output of coal gas would be governed by the demand for gas, and the production rate would be controlled by the requirements for gas going to the chemical processes.

Alternatively, if it could be demonstrated that gas could be used with advantage for motor transport, that is an industrial consumption which will not adversely affect the

load factor. Allied to this is the possibility of supplying gas to distant villages in cylinders.

Apart from these special, more or less theoretical, suggestions, there is the whole gamut of the industrial heating field. The success or otherwise of this development depends partly on technique, but more particularly on gas charges policy. Many companies are hidebound by a legislative restriction in this respect. Many publicly owned gas undertakings on the other hand are cramped by the misdirected policies of individual members of the Gas Committees, who, apart altogether from commercial considerations, will frequently demur at gas being sold for industrial purposes at rates very different from those allowed to the domestic consumer. I believe the question of differential rates of charging for gas of one type or another is of supreme importance to the development of the Gas Industry, both domestically and industrially.

Finally, I am afraid I have kept you rather long in a very long and discursive talk on the position of the Gas Industry. One would like to see an enthusiastic support of development of the Gas Industry from the mining industry. It is to their advantage that we should succeed, but as yet they do not seem to be convinced believers.

I am confident that there never was a time when the Industry was in a better position to make a big step forward in its development and progress.

No industry which is so fundamentally sound as ours, both in supplying the public with what it wants and must have, and in its personnel, is in a better position than ours. All that is required is courage, foresight, and improved collaboration.

I hope I have supplied you with something worthy of your consideration for the fullest discussion.

Discussion.

Mr. R. E. GIBSON (Liverpool) proposed a cordial vote of thanks to Dr. Smith for his valuable paper. Dr. Smith was a man of unbounded energy and had done a tremendous amount of work for the Gas Industry. The author had said they were in for a hard fight. Well, they did not mind that so long as it was a fair fight. If they had to fight on the merits of their commodity he (the speaker) was sure they would win; but, as they all knew, there were many difficulties in the way, and Dr. Smith had suggested some of the means by which these should be tackled.

Mr. E. B. TOMLINSON (Birmingham), who seconded, said Dr. Smith had given them a view of the Industry which they were not often confronted with as engineers. They were so used to hearing of the merits of electricity in the public Press that, through constant repetition, they almost became believers in some of the things stated. He appreciated the remarks about the inferiority complex which was inclined to cover the country, although he did not believe it applied to gas engineers and managers. With regard to the future he agreed with Dr. Smith that the Industry was in a distinctly hopeful position. He believed they would continue to progress, but he felt that they ought to go far more into the enemy's camp and have all-gas houses to exhibit in the cities, towns, and villages of the country. A gentleman who went in for an all-electric house some three years ago came to him and wished him "good-bye." He had seen him since and he had had to have all his floors up, because he would not previously have a gas pipe installed.

The CHAIRMAN (Sir Francis Goodenough) said that morning's paper provided an endorsement of Dr. Smith's remarks. In the *Daily Sketch* there was a picture of West London's great black-out. This was stated to be the first since the Wimbledon station was taken over by the grid, so obviously they were hoping for more. In an advertisement in the same paper it was stated that "meat loses less weight when cooked by electricity." Those who wrote that knew it was not true, and the Gas Industry was prepared to prove that at any time. In fact the proof was given only a short time ago in the report of the Committee of the British Medical Council which gave the lie to that statement independently. It had been proved by independent medical men there was no difference in the result from the point of view of nourishment in the meat cooked, as between gas and electricity.

A LONDON HOME FOR THE INDUSTRY.

Mr. W. T. DUNN said reference had been made to collaboration with other industries and particularly the mining industry, which was deeply concerned with the success of the Gas Industry. He would like to know if any steps had been taken to approach the Institution of Mining Engineers on the subject. There was no doubt at all they must co-operate to-day, and he thought they should ask those in charge of the different organizations representing the different sections of the Industry to come together to see if some general council could not be formed. He looked forward to the time when the Gas Industry would have a suitable building of their own in London. He thought perhaps this idea might be considered in connection with the memorial to the late Sir Arthur Duckham.

Mr. W. W. ATLEY (Stockton-on-Tees) said they wanted to start with the younger generation and particularly he would draw attention to the advisability of inviting both boys and girls to visit gas-works. If they could get them to talk gas he thought they were going to help the Industry to a very great extent.

Mr. C. S. SHAPLEY (Leeds) said they had had large numbers of school children through the works, but he thought they ought to go further and have a Women's Gas Association. He had been following the ramifications of the Women's Electrical Association in the West Riding, and he could assure the conference the members were a fine lot of commercial travellers for the electrical industry.

Mr. A. W. SMITH (Birmingham) said he agreed with the suggestion for a British Gas Association and Fuel Commissioners instead of Electricity Commissioners. They had to face the fact that industry and governments were definitely linked together, and they had a government which was, he would not say interfering, but entering more and more into discussions, with various industries, and to some extent guiding their development. Some people thought a mistake was made in not having pressed for Fuel Commissioners, so that the whole field could have been properly surveyed. He regretted the diatribe against electricity. While they praised gas they should not damn electricity. They were large users of electricity at the gas-works, and many of their biggest gas customers were large electrical appliance manufacturers. Electricity could not carry the gas cooking load on a Sunday, and electrical engineers knew it.

"ELECTRICALLY BLINDED."

Mr. H. C. SMITH (Tottenham) said he had always supported Sir Francis strongly in the past when he had said that in their propaganda they must talk about the good things of gas and not say anything about competitors. He was beginning to feel, however, that the time had arrived when they must talk about their competitors. The Chairman of his Company, in an address at the annual meeting, said the trouble was that people were not becoming electrically minded but electrically blinded in more senses than one. Indeed the position to-day was a very serious one. It had been suggested that the Gas Industry had grown up on a natural sort of food, but he thought the electrical industry had been forcibly fed; and what the result was going to be he did not know. The grid was an unfortunate ramp and had to be paid for. If it was paid for by the consumers of electricity the price was bound to go up. They had seen that the Commissioners were getting nervous and were beginning to take an active interest in the Electrical Development Association. What Government Department was taking an active interest in the B.C.G.A.? The grid had to be paid for, and it was up to them to see that the consumers of electricity paid for it, and that they did not pay for it indirectly as gas consumers. People were so blinded to electricity they accepted failure as a matter of course, and got a few candles in the house. Mice and birds were blamed for failure, and when there was fog and frost in January it was said to be unseasonable weather!

Alderman CARVER (Leicester) said that two years ago the Electricity Department made a big profit and the Council allowed them £60,000 for assisted wiring schemes, the argument being that the people who were better off had had electricity for lighting their homes for a long time, and it was only right the working people should have a chance to use electricity. The introduction of the schemes undoubtedly affected the output of gas considerably. He thought that wherever possible there should be combination of smaller undertakings with larger ones. In one case a village had grown up four miles away, and those who lived there had to pay more for their gas than they did in the city. As a consequence they were favouring electricity. They might improve the load by the introduction of central heating in large buildings. The Leicester Town Hall boilers were now fired by gas.

Alderman J. MILLAR (Widnes) suggested that the paper might be distributed widely to members of committees, directors, industrialists, and others. He was glad to see it was said the business of the Gas Industry was to produce cheap gas. He was sorry it was not to produce *and sell* cheap gas. One of their failures was that when they had produced cheap gas they had not sold it cheaply. They had reached the point where there was nearly uniformity in regard to quality, but why should they not have some uniformity in regard to the charges they made to the public. The difference in the prices charged at various places was amazing. He knew there were handicaps. Some authorities were making too large a contribution to the reduction of rates. That was a burden on the Industry and did not give them a fair chance in the present competition. The Industry had been neglected in regard to municipal housing estates. He came across a slum clearance scheme the other day where 130 people were taken from all-gas houses and placed in new houses which were all-electric. That was very unjust opposition. He also found out that these people were asking to be supplied with gas.

A FAIR PRICE.

Col. W. M. CARR (Stretford) thought the idea of distributing the paper was an excellent one. He thought a fundamental consideration upon which the development of the Industry depended was the proper appreciation of a fair price to charge. They had been too long in the habit of looking at their average costs when the gas was piped into the home. If they were going to sell gas to industry and domestic consumers they had to give their minds to the cost of running a particular service and have regard to the quantity which was taken. If they did that he had the utmost confidence in their future development.

The CHAIRMAN said the B.C.G.A. would see that the paper was made available to undertakings throughout the country.

Dr. SMITH said they must adopt a 100% fighting policy, but that did not mean they would use the methods of the other side. They had a good case without exaggeration, but they needed to meet the whole of the propaganda and the misstatements which were made. It was only the policy adopted in every form of commercial life. There was no reason whatever why they should not greatly increase flexibility in regard to charges for gas. That was one of the reasons why he was in favour of Commissioners. Only by having some unifying and directing force with power to act was it possible to get such a system through the Industry as a whole. He was certain that within a few years they would have Commissioners foisted upon them, and it was best they should get a scheme out in advance rather than have some thing which would be as vicious for them as the Electricity Commissioners were for the electricity industry.

Major F. G. WRIGHT (Swindon) proposed a cordial vote of thanks to the Chairman, and Mr. H. E. BENNET, who seconded, said that so far as the Society of British Gas Industries were concerned they hoped the producing side would achieve the 100% co-operation for which it was striving, and they on their side were waiting to co-operate. One British Gas Association would be one of the best steps ever made in the Industry.

The resolution was carried, and the CHAIRMAN responded.

Gas Lighting at the B.I.F.

Motorists and others have had an opportunity at the British Industries Fair at Castle Bromwich of comparing the latest forms of gas and electricity for road lighting purposes. A section of the new road which will finally encircle the Fair has been lighted by both gas and electricity. The gas section consists of 38 columns about 60 ft. apart, each carrying two low-pressure 10-mantle lamps of approximately 1000 c.p. each. The electrical section of the road has been done by Mazda Mercia lamps, 25 ft. high with 70 ft. spacing on one side of a 30-ft. road. Tests of the two types of lighting show that the gas-lit section at its mean test-point illumination is 1·7 in the 20-ft. roadway and 1·25 in the 30-ft. roadway, which means that both these roads are in Class B for lighting purposes. The mean test-point illumination of the electrically lit portion of the road is 0·425, which, according to the British standard specification for road illumination, brings it into Class D. The gas-lit portion of the road is free from shadows and glare; and visibility even in misty weather has proved extraordinarily good. During the Fair many road surveyors from all over the country who were attending their annual Conferences took an opportunity of visiting the gas-lit section and expressed their unqualified approval.

Conference Luncheon at the Fair.

Delegates to the Joint Gas Conference at the B.I.F., Castle Bromwich, were entertained on Wednesday last at luncheon by the Birmingham Chamber of Commerce and the Fair Management Committee.

Major F. W. SMITH (Vice-Chairman of the Birmingham Chamber of Commerce), who presided, proposed "The Gas Industry." He said that, as a manufacturer, he was much impressed by the progress which has been made in the automatic control of gas furnaces. Gas was essentially an adjustable and controllable fuel, and the refinements of automatic control now possible would prove of the greatest value for industrial purposes. Prior to his closer association with the Gas Industry, he held the erroneous impression, as so many others still did, that severe competition between electricity and gas would ultimately lead to the survival of the fittest. He now knew that, although that competition would continue in certain directions, there was ample room for the two industries to continue to develop on parallel lines, and that there was vast room for progress in front of each.

PUBLIC LIGHTING.

Increasing road accidents urged better public lighting, and might well lead to the greater use of gas, because of its many advantages, not the least of which was its proved reliability, and its claims to be able to provide admirable results at low costs.

The Company with which he was associated—the Redditch Gas Company—had recently lighted a portion of the main Evesham Road, outside Redditch, as a demonstration of what could be achieved by gas lighting. The demonstration had convinced him, as he believed it has convinced others who had seen it, that for a given outlay and a given cost of maintenance, gas was vastly superior to electricity for such a purpose. The fact was further borne out by the gas lighting installed on the north side of the Fair.

Col. W. M. CARR, in replying, paid a tribute to the work of the Birmingham Gas Department in regard to the joint exhibit under the able leadership of Mr. A. W. Smith, and he spoke of

the great amount of work done by the Hon. Secretary, Mr. Spinks. The success of the exhibit was in a large measure due to his excellent work. In the field of heating he regarded electricity as their smallest competitor and not such as they had in solid fuel and oil. They were hoping for greater freedom in the Gas Industry, and that they would be trusted by the somewhat doubting politicians to manage their own business for the benefit of the public they served. The greatest safeguard was not an Act of Parliament but the fact that the Gas Industry was a highly competitive Industry, and unless it served the best interests of the whole of its customers it could not hope to succeed.

Heat-Resisting Enamels.

The stand of Messrs. Nobel Chemical Finishes, Ltd., at Castle Bromwich, displayed the complete range of "Belco" and "Necol" cellulose finishes and "Dulux" and other synthetic resin materials.

Of particular interest were the "Nobel" heat-resisting enamels which were shown on gas fires. These enamels are made in a wide range of colours and possess in high degree resistance to heat and retention of beauty of shade and gloss. Furthermore, they are extremely durable and will withstand all normal household wear and tear and have excellent adhesion to metal which makes them chip-free.

The "Belco" and "Necol" cellulose finishes are, of course, well-known and have for long been used in the Gas Industry for a variety of purposes. The new "Dulux" enamels would be admirably suited for finishing such articles as gas meters, while this firm also handle the sales of "Melanoid" bituminous paints, which are so widely used.

Also of interest was the special display of materials for solving anti-corrosion problems on all types of metal, both for the removal of rust and for the prevention of corrosion on new metal before painting. Simplicity and economy of application are features of Nobel enamels, and it is stated that one coat applied by spray and stoved for one hour at 210° F. or half-an-hour at 250° F. will produce a perfect finish.

Nobel heat-resisting enamels are available in three lines—

31-line—for such work as a one-coat finish on ground gas fire castings.

32-line—for use only as a two-coat system, possessing to a high degree resistance to discoloration under heat, in addition to excellent adhesion, gloss, and resistance to chipping.

33-line—for one-coat finish on equipment demanding a higher standard of heat resistance than 31-line.

For underground castings special heat-resisting undercoats are available with which a perfectly smooth surface may be obtained economically.

London Section of the B.I.F.

Gas Products Exhibited

Two attractive displays of gas products were staged at the Olympia Section of the British Industries Fair on adjoining stands by the Gas Light and Coke Company and the South Metropolitan Gas Company—both of them showing in a striking manner the very wide range of useful chemicals for a vast number of applications which present-day gas-works practice enables to be produced from coal.

Refined cresylic acid, distilled carbolic acids, &c., are now marketed by the Gas Light and Coke Company to British Standards Institution Grades, and an effective display of the Company's residuals was arranged in their export trade packages.

The chemicals exhibited are produced under modern conditions at the Gas Light and Coke Company's Works at Beckton and Southall. Special attention is paid to the production and delivery of a very high grade of distilled tar for the surface-dressing of roads, the manufacture of tarmacadam, &c. This is supplied in drums, barrels, and rail-tanks, while a large fleet of road tanks, fitted with every appliance for delivering tar hot, either to contractors' plants or for spraying direct on to the roads, is maintained by the Company. The amount of tar produced by the Gas Light and Coke Company per annum is in the region of 29 million gallons, while the sulphate of ammonia made totals some 20,000 tons.

An interesting illustrated brochure available on the stand listed the tar, ammonia, and inorganic products manufactured by the Company, giving specifications of each, together with details as to their chief applications.

The stand of the South Metropolitan Gas Company is always novel in its design, and this year was no exception. The display took the form of an organ, complete with keyboard and pipes, the keys reading "Switch on the gas for Metro products." The organ stops were actual gas switches, which, when, operated, illuminated individual sample bottles of residuals disposed in the organ pipes.

Arranged about on either side were further examples of the Company's bye-products, including "Metro-Coalite," low-temperature coke, and "Solarite." The latter is a grade of coke which has been produced to meet the requirements of customers who, for various reasons, experience difficulty in controlling or maintaining a fire throughout the night in small domestic boilers. This coke responds readily to damper regulation, burning up rapidly when the dampers are opened and a hot fire is required to heat large quantities of water quickly; or, when the dampers are closed, it will burn slowly for long periods without attention. "Solarite" is stated to have a very low ash content, and its use reduces clinker troubles to a minimum. Various types of wood-preservative and varnish are also exhibited.

Sulphuric Acid Spraying.

The South Metropolitan Gas Company are undertaking a new and interesting development in connection with their sulphuric acid production. This comprises the spraying of crops in the Home Counties, particularly for the destruction of weed and charlock, of which 96% can be killed by sulphuric acid. Spraying with sulphuric acid, though a new process in this country, is common farming practice in other parts of the world. Charlock can be destroyed in all cereal crops by acid spraying, and fine weather is not necessary for the spraying operation.

The inside of the Company's stand took the form of an information bureau, warmed by an attractive "Metro-Log" gas fire, controlled by a tap fitted flush in the wall at hand level. On either side of the fireplace were gas lighters and ash trays combined for smokers, while the lighting was, of course, effectively carried out by gas.

The South Metropolitan Gas Company have two chemical works dealing with bye-products from some 12 million gallons of tar and 50 million gallons of ammoniacal liquor annually, and a booklet available on their stand gave details and specifications of their products.

The I.C.I. Stand.

This year the three chemical manufacturing groups of Imperial Chemical Industries, Ltd. (I.C.I. Alkali, Ltd., I.C.I. General Chemicals, Ltd., and the I.C.I. Dyestuffs Group) combined in a central exhibit, which illustrated very graphically the world-wide representation of the Parent Company. Every place in the world in which I.C.I. has direct representation was marked on a globe in a prominent position on the stand, and this was backed by a map of the British Isles, showing the location of the Company's offices and factories.

Special prominence was given to products of exceptional novelty or interest. In the Alkali section, which occupied the right-hand side of the stand, these included a new alkaline detergent, marketed under the name of "Lustros," for the cleansing and scouring of bottles. In addition, water-softening chemicals of a high degree of purity, such as sodium alluminate and soda-ash, were displayed, and a feature was made of sodium carbonate, monohydrate, manufactured by I.C.I. (Alkali), Ltd. This is one of the purest known forms of this all-important alkali product.

The exhibit of I.C.I. (General Chemicals), Ltd., included samples of "Seekay" wax, a non-inflammable product. Various grades of this wax, covering a wide range of melting points, were shown. Rubber is being increasingly used in modern construction, notably in the form of tiles for flooring. Seekay wax enables these floor coverings to be rendered flame-resisting without detracting from the useful properties of the rubber.

The most striking exhibit in the dyestuffs section was strips of aluminium, dyed in various colours. Hitherto metal was about the only substance in common use which had resisted all efforts of the dyer. Even now aluminium is the only metal which can be treated. A new process has made possible the modification of the surface of this metal so that it will take up and retain any known direct colour, thus opening up great possibilities in decorative and constructional work.

BOOK REVIEWS

"SPECIFICATION," 1934 EDITION.*

By "CRITIC."

Two of the special articles in this year's edition of "Specification" deal with rather interesting subjects—namely, Town Halls, and Sports Grounds, Pavilions, and Stands. Although reference to gas service does not come within the scope of the articles the modern trend of design portrayed by the many excellent plans and illustrations accompanying these articles is well worth close study. In consideration of the number of "Sun" burners employed in spacious halls to provide ventilation and to fulfil obligations in respect of emergency lighting, it would appear that such aspects of gas lighting should be brought more to the notice of our friend the architect. Mention is made of battery stand-by lighting equipment, but gas lighting is only vaguely hinted at in this connection by use of the expression "other services."

There should be scope in a future edition for a treatise on the application of gas for space heating, water heating, and cooking in modern buildings such as the town halls and sports pavilions, otherwise so comprehensively dealt with in the edition under review.

The space devoted to solid smokeless fuel firing has been extended, and the section dealing with "Gas Coke for Central Heating and Domestic Supplies," written by Dr. F. M. H. Taylor, is full of informative matter which should prove most useful for reference purposes. While on this subject the attention of those interested might well be directed to the "Notoil" automatic stoker which was recently put on the market by Messrs. Hartley & Sugden, of Halifax, to facilitate the use of gas coke; perhaps mention will be made of this interesting development in the 1935 edition.

An interesting addition to the oil fuel section is the inclusion of a paragraph dealing with "British Furnace Oil." This oil is a special creosote produced in gas-works, and a typical specification of the oil is set forth. Mention is also made of the fact that suitable winter and summer grades of this oil are now available.

The Gas Light and Coke Company and the British Commercial Gas Association must again be congratulated on their effective advertising matter, which certainly adds tone to the Gas Engineering section.

"Specification" in its 36th edition proves to be as good value as ever and deserves to find a large circle of readers.

* The Architectural Press, 9, Queen Anne's Gate, S.W. 1. Price 10s. 6d. net.

COAL IN THE NEW ERA.*

A book by Ivor Thomas entitled "Coal in the New Era" and selling at 5s. will prove of interest to all connected with Britain's problem of utilizing coal to the best advantage; and who is not concerned with this question, the importance of which, never doubted, has become more prominent? This prominence is due to a number of national and international factors; and the whole matter of the best use—or, rather, uses—of coal is exceedingly complicated. During and since the war science has been busily employed and has resulted in a changed outlook on coal. The different forms of smokeless fuel made by both high and low temperature carbonization have received a certain amount of much-needed publicity. There has been the propaganda of the gas and electricity industries. The importation of increasing quantities of foreign oil has caused research to solve, technically at any rate, the problem of producing, by hydrogenation, superior motor fuel from coal. Research in another direction has been actively pursued, and with much promise of success, into the use of coal gas as a substitute for imported petrol for internal combustion engines. Then we have the growing sales of electricity. All this, and more—such as benzole recovery, and the growth of new industries based on derivatives of tar—should make it abundantly clear to all that the burning of raw coal is entirely out of tune with modern life and bad for a nation possessed of some of the finest coal deposits in the world. All the time, of course, one is faced with a large body of unemployed miners.

The author of "Coal in the New Era" has an excellent grasp of the manner in which coal is processed by the Gas Industry, and his book will help the layman to appreciate the magnitude and potentialities of the Industry. He pins much faith to the low-temperature carbonization industry, stresses the point that gas and electricity are allies of coal, calls attention to the development of the use of coal gas as a motor fuel, believes it in the interest of the nation to produce petrol from coal by hydrogenation, despite the apparent loss to the Exchequer, and would make the burning of raw coal a legal offence. He charges the coal industry with failing to carry out research work.

Mr. Ivor Thomas has presented many facts—and they are facts—in a most readable way, and the book is likely to appeal to a wide public. It is obvious that he writes with political fervour. Let us look to his solution of the present competitive mix-up of fuel interests, the while the coal industry is in sorry plight. He maintains that coal should be treated at the pithead by high-temperature or low-temperature carbonization, that electricity should be generated at the pithead, that there should be separate grids for ordinary coal gas or coke oven gas and low-temperature gas. Laboratories would be set up at the pithead, where there would be full control of bye-product recovery. Finally, at a strategic point in each of the great coalfields will be a hydrogenation plant. The "low-grade" heat developed in the hydrogenation process will be used for greenhouses, "which will strike a pleasing note in the midst of so much industrialism." A National Coal Board (a public utility corporation such as the B.B.C.) would be set up which would build up "an industry completely unified from the coal face to the domestic grate, and from the pit to the petrol tank. . . ." The Board would, after the gas grid has been established, take over the gas companies. Absorption, suggests the author, should not be too difficult, since "most of the gas companies are municipally owned. Once the Gas Industry has been taken over, the way is ready for absorbing the electrical industry. . . ." The next step is a National Power Board which "will be able to plan production and direct consumption in a way that is not possible under the present haphazard system. At present there is a perfectly preposterous competition of gas and electricity with each other, and a milder form of competition with coal and coke." Exeunt the B.C.G.A. and the E.D.A.; enter the maximum possible efficiency and reward for the workers more in accordance with their deserts. A tall order, Mr. Thomas, but a very interesting book!

* "Coal in the New Era," by Ivor Thomas. Published by Putnam, 24, Bedford Street, W.C. 2. Price 5s. net.

NEW DETECTIVE STORY BY WELL-KNOWN ENGINEER-DIRECTOR-NOVELIST.

A new book by Francis Everton is an event of interest to our readers, since "Francis Everton" is the pen name hiding the well-known personality of F. W. Stokes.

As Mr. F. W. Stokes he is known as Managing Director of the Sheepbridge Stokes Centrifugal Castings Company, Ltd., Managing Director of Stokes Castings, Ltd., also of Kirkham Hulett & Chandler, Ltd., Gas Engineers, of London, and of Sheepbridge Stokes Engine Liners, Ltd. He has been largely responsible for the development of a special process for making castings under centrifugal pressure, which is being operated by these companies.

As "Francis Everton" he is known as the author of a series of first-class detective stories—"The Dalehouse Murder," "The Hammer of Doom," "Murder at Plenders," "The Young Vanish," and now the Crime Club announce that they have chosen his new book, "Insoluble," as their selection for March.

"Francis Everton" is only a hobby of Mr. Stokes, his books being written during his spare evenings at home. He never had any idea of writing until one day after going to play in a Tennis Tournament in Lincoln he saw a notice on the pavilion walls, "Dark Deeds Done on the Stairs," and his wife suggested to him that *there* was the idea for a detective novel. She urged him to write it, bet him that he could not, and then helped him win his bet. And that is how "The Dalehouse Murder" saw the light, being highly praised on publication by Arnold Bennett, who said: "'The Dalehouse Murder' is at least as good as any modern detective story I have read since Conan Doyle and Gaston Leroux. The whole affair coheres and convinces. . . . I attend Mr. Everton's next work with considerable interest."

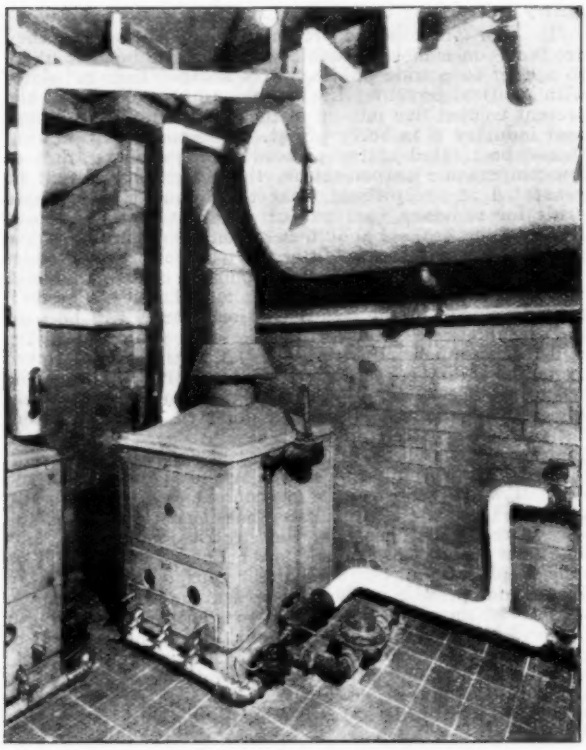
Born in 1883, Mr. Stokes was educated at Queen Elizabeth's Grammar School and later at the University College at Nottingham, where he graduated in engineering.

The publishers are W. Collins, Sons, & Co., Ltd., 48, Pall Mall.

New Gas Installations at Stratford-upon-Avon

Important gas installations for cooking, hot water supplies, central heating, &c., have recently been carried out at Stratford-upon-Avon.

On the catering side the kitchen attached to the Riverside Restaurant (situated near the Memorial Theatre and well known to visitors to Stratford-upon-Avon) has to provide at times for large parties at very short notice; so that



"IDEAL" CENTRAL HEATING BOILER,

By the National Radiator Company, Ltd., at Stratford-upon-Avon. This boiler is fitted with motor-driven circulating pump and automatic temperature control.

it was essential that the apparatus installed should give quick service.

The kitchen is fitted with the following cooking apparatus, the whole being in mottled enamel finish:

One 4-oven " Bordo " central cooking range, 5 ft. 6 in. by 5 ft.
One double " Cito " griller.
One " Vega " steamer.
One " Sector " hotcloset and carving table, 6 ft. long with two carving recesses and bain marie.
One " Friar " fish range with two pans.

All this apparatus was supplied by Messrs. J. Wright & Co., of Birmingham.

In the service rooms is fitted one of the latest Jackson Boilers, Ltd., " XL " water boilers—an " XLB " model, delivering 320 pints of freshly boiled water per hour. This appliance is fitted with 12-pint milk and 12-pint coffee containers, the latter incorporating their " Filtomaton " system of coffee-making. The set is in chromium-plated finish.

For hot water and central heating requirements both gas and oil received careful consideration, but gas was accepted owing to its cleanliness, convenience, and the fact that the storage space required for the oil could be advantageously used for other purposes. The domestic hot water is heated on the calorifier system by an " Ideal " gas boiler, No. 2 GB 6 size, mottled enamel finish. The central heating is worked by a No. 2 GB 7 " Ideal " gas boiler (also in mottled enamel), fitted with a motor driven circulating pump. Both these boilers are fitted with automatic thermostatic temperature control, and were supplied by the National Radiator Company, Ltd., of Hull.

Gas in a Hairdresser's Establishment.

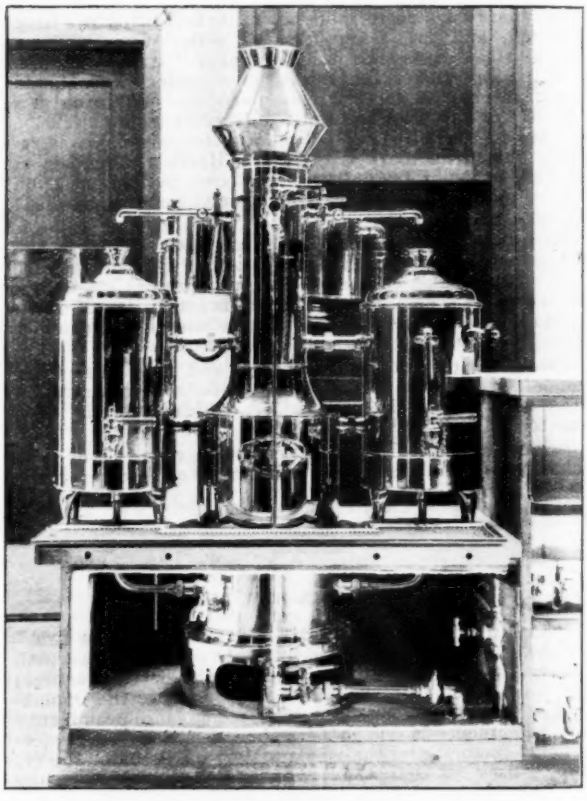
Another business, belonging to Mr. Alfred Ladd, hairdresser, of Sheep Street, Stratford-upon-Avon, also contains a modern gas installation for central heating and hot water services. Hot water is required for eleven cubicles and service rooms, and this is provided by a No. 1,530 " Sun " boiler, thermostatically controlled and supplied by Messrs. J. Wright & Co., of Birmingham.

The central heating boiler, which also heats the flat above the business premises, is an " Ideal " No. 1 GB 7, in mottled enamel finish and thermostatically controlled. This was supplied by the National Radiator Company, Ltd., of Hull. The flat is provided with a " Berkeley " switch tap cooker and a " Nea " 38 " Ascot " water heater.

The whole of the apparatus was supplied by the Stratford-upon-Avon Gas Department, and the hot water installations were carried out by Messrs. Parker, Winder, & Achurch, Ltd., of Birmingham, to the instructions of the Architect, Mr. L. L. Dussault, F.R.I.B.A., of 39, Newhall Street, Birmingham.

A Gas-Equipped Canteen.

The Farmers Union Insurance Company, Ltd., of Stratford-upon-Avon, have also carried out extensive additions to



JACKSON WATER BOILER,

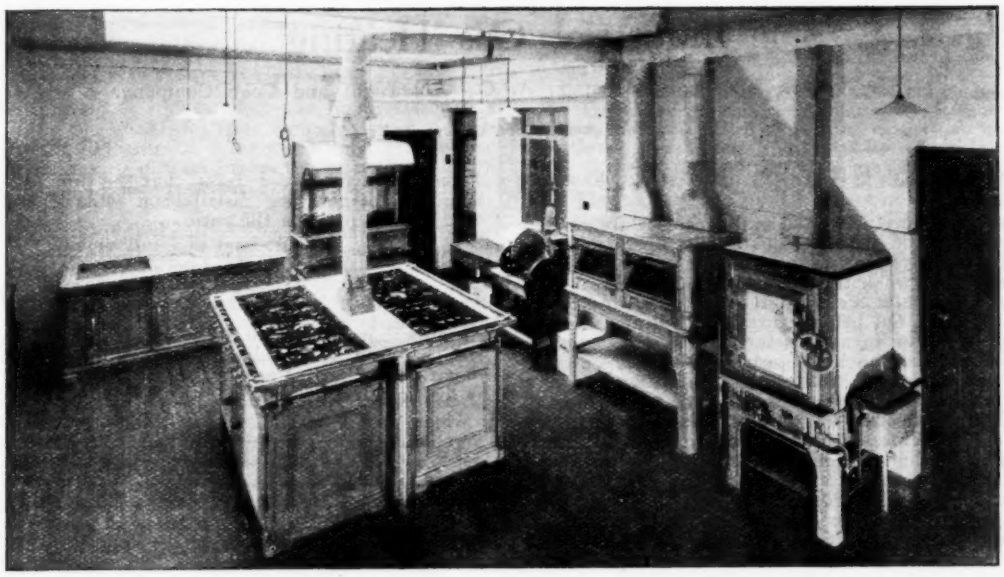
In combination with milk and coffee containers, in the service room of the Riverside Restaurant, Stratford-upon-Avon.

their offices which included the provision of a canteen for staff requirements.

The Gas Department were entrusted with the whole of the canteen gas installation which comprises:

One No. " 0 " " Westminster " cooker, in mottled enamel finish, supplied by Messrs. Wm. Sugg & Co., Ltd., of London.
One " Nea " 38 " Ascot " water heater.
One large kitchen model " Electrolux " refrigerator, by Electrolux, Ltd.
One No. 4 " Eclipse " water boiler, producing 350 pints of boiling water per hour, with 6-pint milk and coffee urns, by the Eclipse Copper Company, of York.

The accepted estimates for the above works amounted to nearly £1,000.



UP-TO-DATE GAS EQUIPMENT IN THE KITCHEN OF THE RIVERSIDE RESTAURANT, STRATFORD-UPON-AVON.

CONTINENTAL NOTES

COMBUSTIBLE PROPERTIES OF GASES OF LOW CARBON MONOXIDE CONTENT.

In view of the interest now being shown in de-toxicated town gas, D. Witt, in *Das Gas- und Wasserfach*, 1934, 77, 97-102 (Feb. 17), reviews the combustible properties of gases low in carbon monoxide.

The desirable characteristics of town gas are first discussed with special reference to the calorific value range 419-450 B.Th.U. per c.ft.

(1) A calorific value much lower than 419 B.Th.U. per c.ft. is not desirable, since, for a given therm distribution, the mains might be overloaded. On the other hand, the maximum figure may be exceeded by 10-20 B.Th.U. per c.ft. without adverse effect on burner performance.

(2) The specific gravity should not exceed 0·5 or the efflux velocity from burners will be too low and distribution costs will be increased. In practice, the specific gravity may be as high as 0·54 without fear of serious difficulties. Low specific gravities, down to 0·4 are permissible provided conditions (3)-(5) are fulfilled.

(3) The maximum ignition velocity (ignition velocity of the air-gas mixture having the maximum ignition velocity) of town gas is generally between 20 and 28 in. per second. If possible, the value should not be less than 20 in. per second or the flame will be too long. A velocity exceeding 28 in. per second gives rise to striking back in an ordinary burner.

(4) The Ott number, which indicates that setting of the air slide of a Teclu burner at which the flame strikes back or flickers, should not be below 55 or striking back will occur in an ordinary burner. No experimental data are available for the upper limit which may, perhaps, be tentatively fixed at 80.

(5) The composition must be in harmony with the preceding requirements.

Effect of Dilution on the Properties of Coal Gas.

The effect of dilution with water gas, producer gas, and waste gas is considered with the help of tables and curves. The following properties are taken as typical for coal gas: *C.V.* 523-576 B.Th.U. per c.ft., *Specific Gravity* 0·34-0·45, *Maximum Ignition Velocity* 24-28 in. per sec., *Ott Number* 90-120. The high Ott number is primarily due to the high air requirements and low specific gravity of the gas.

When blue water gas is added to coal gas, the calorific value, the Ott number, and the air requirements progressively fall. The specific gravity and maximum ignition velocity increase. Similar effects are observed when producer gas is the diluent, save that, in this case, the maximum ignition velocity decreases as the amount of diluent increases. Waste gas acts like producer gas, save that its effect on ignition velocity is more pronounced.

Gases of Low Carbon Monoxide Content.

The gases were prepared by the catalytic treatment of town gas. By the agency of steam, the bulk of the carbon monoxide was converted into carbon dioxide with simultaneous formation of hydrogen. The remainder of the carbon monoxide was converted into methane by catalytic hydrogenation. Calorific value and specific gravity were adjusted to desired values by various means such as extraction of part of the carbon dioxide or addition of nitrogen and hydrogen, hydrogen and carbon dioxide, or hydrogen alone. The gases investigated had, in most cases, a carbon monoxide content below 1% and consisted essentially of carbon dioxide, hydrogen, and methane. The procedure was to make adjustments to the combustible properties by replacing the carbon monoxide eliminated by nitrogen which has the same specific gravity and adding hydrogen to adjust the ignition velocity. However, it was not possible to secure a satisfactorily high ignition velocity with a specific gravity of 0·5 and a calorific value of 440 B.Th.U. per c.ft. By almost complete elimination of the carbon dioxide and addition of hydrogen to adjust the calorific value, a satisfactory ignition velocity could be obtained, but only at the expense of a low specific gravity and a high Ott number. It is obvious that ignition velocity is not the only factor affecting the Ott number, but that specific gravity also plays a part.

At a specific gravity of 0·5, gases of low carbon monoxide content have a high Ott number due to their low ignition velocity. Such gases burn with a very long flame and may give rise to incomplete combustion if the flames play on a cold surface. To avoid this, the specific gravity of gases low in carbon monoxide should not exceed 0·4-0·48 for calorific values of 419-450 B.Th.U. per c.ft. Such a gas is best prepared from a parent gas of C.V. equal to 440 B.Th.U. per c.ft. made by dilution of coal gas with water gas. The carbon monoxide content is reduced from its level of 18-20% partly by oxidation with steam and partly by conversion to methane. Carbon dioxide must then be removed to a certain extent to adjust the specific gravity. The gas has an adequate ignition velocity, lower, however, than that of the parent gas, but its Ott number is higher than that of the parent gas. It may be used with equal efficiency to that of the parent gas and its characteristics are somewhat similar to those of a gas prepared by the dilution of coal gas with producer gas. Two instances of the composition and properties of gases of low carbon monoxide content are as follows:

—	CO_2.	O_2.	C_nH_m.	CO.	H_2.	CH_4.	N_2.	Sp. Gr.	C.V.	Max. Ignition Velocity.	Ott Number.
Parent gas. . . .	3·2	0·4	2·0	20·1	48·8	16·7	8·8	0·429	431	24·6 in./sec.	59
Reformed gas (1). .	10·8	0·4	0·6	0·8	54·2	21·3	11·9	0·479	422	19·7 in./sec.	72
,, ,, (2). .	6·6	0·2	0·9	0·7	52·9	24·6	14·1	0·462	449	20·3 in./sec.	80

Industrial Gas Heating*

By Peter Lloyd, B.A.Cantab., A.I.C., Gas Light and Coke Company.

[*Concluded from p. 560 of last week's issue.*]

Loss of Heat Stored in Furnace Walls, Heat Transfer Media, &c.

Only a small minority of industrial processes are carried on continuously, and in all discontinuous operations the heat stored in the system is liable to be lost by dissipation during the periods when the plant is standing idle. In a furnace, for instance, a certain weight of metals and brickwork has to be heated before working conditions are obtained, and when the furnace is turned out and begins to cool down the stored-up heat is gradually lost. Besides causing a loss of heat when the furnace is turned out, a high thermal capacity also causes a loss of time owing to the fact that the heating-up process is inevitably slowed down. It can therefore be further stated that the thermal capacity of an appliance should in general be reduced to a minimum. In certain cases, however, a high thermal capacity is required to avoid sudden temperature drops when heavy loads have to be suddenly heated. It is clear, for instance, that if a heavy charge of metal is inserted in a furnace having brick-work of low thermal capacity the temperature of the system will inevitably fall. Certain industries have their own pet phrases for describing the effect of thermal capacity. The baker, for instance, distinguishes between the " solid heat " or the " consolidated temperature " of an oven with ample thermal storage, and the " flash heat " of an oven which is only superficially heated. These phrases are unscientific, but they have a very real meaning and must not be neglected. Again, bakelite moulders will talk about the " wet heat " of a steam heated press, meaning much the same thing. The need for high thermal capacity in bread baking ovens will be clear when it is considered that these ovens are charged with some hundredweights of wet dough at a temperature of under 100° F., and satisfactory baking will not be obtained if the oven drops more than 60° F., say, from its setting of 450°-500° F. In such cases as this the material used for heat storage is normally firebrick, which combines a reasonably high specific heat (0·2 B.Th.U./° F./lb.) with ability to withstand the usual working temperatures.

The effect of thermal capacity on heating-up rate, which was mentioned above, is one which has to be examined quantitatively, but the way in which this problem arises may be illustrated by considering the design of a furnace which is required to work with a specified rate of heat loss by conduction through the walls. Considering this problem in terms of linear flow it is clear from the equation

$$H = \frac{kA\,(t_1 - t_2)}{d}$$

that the heat loss through the walls would remain unaltered if instead of the thickness of insulation d with conductivity k, it received a thickness $5d$ with a coductivity $5k$, or, to express this in more practical terms, the replacement of one course of insulating bricks by five courses of firebricks would have no effect on the equilibrium value of H. Apart from other disadvantages, however, this process would have the effect of multiplying very considerably the thermal capacity of the furnace wall, so that the time to heat up to a given temperature would be greatly increased.

The rate of heating of a furnace is therefore enhanced by low conductivity and low thermal capacity, but when a body is to be heated uniformly, as, for instance, when a piece of refractory material is fired in a furnace, then the rate of heat penetration is increased by high thermal conductivity. It depends, in fact, on the function

$$\frac{k}{c} \text{ or } \frac{\text{Thermal conductivity}}{\text{Specific heat per unit volume}}$$

which is known as the thermal diffusivity or temperature conductivity. The simplest case of this unsteady heat flow is a slab of material of infinite thickness at a temperature t_0, the surface temperature of which is altered and maintained at t_1. As time passes the temperature within the slab approaches t_1 and the heat flow is given by the formula

$$H = \frac{k(t_1 - t_0)e^{-\frac{cx^2}{4kT}}}{\sqrt{\pi k T}}$$

where H = heat passing in unit time across a plane distant x from the surface, at which a temperature t_1 is applied to a body at a temperature t_0, having a conductivity k and a specific heat per unit volume c, after a time T.

From this it may be deduced that the time taken to reach a given temperature distribution will depend, if other things are equal, on the ratio

$$\frac{\text{Specific heat per unit volume}}{\text{Conductivity}},$$

or expressing this mathematically, $T \propto \frac{c}{k}$. Using this formula it is possible to draw curves showing the relationship between time and temperature distribution in bodies of various shapes. A number of these curves are reproduced in fig. 2. They demonstrate the time taken for the body to

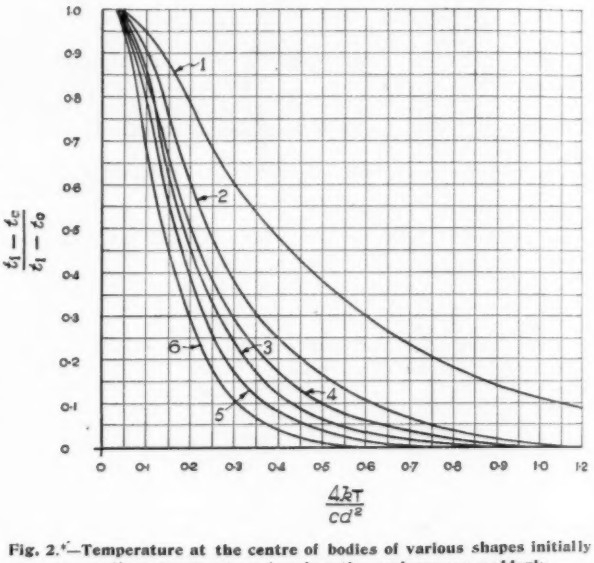


Fig. 2.—Temperature at the centre of bodies of various shapes initially at a uniform temperature t_0, when the surfaces are suddenly raised to a temperature t_1.

1. Slab	d = thickness
2. Square bar	d = side
3. Cube	d = side
4. Cylinder (very long)	d = diameter
5. Cylinder (length = diameter)	d = diameter
6. Sphere	d = diameter

reach uniform temperature to be given by Y = O—that is, by the intersection of the curve with the X axis. In using these curves it must be borne in mind that they assume the maintenance of the altered temperature t_1 at the surface. If the rate of heat transference to the body from its environment is less than the calculated rate of heat flow across the surface, then the surface temperature will not in fact be maintained at t_1. With metallic bodies this is usually the case. Consequently the rate of heating depends not on the thermal constants of the metal itself but on the rate of heat input from its surroundings.

Heat Loss in Flues.

Heat loss in flues is common to almost all gas appliances and need not be discussed in detail. It may be mentioned, however, that it is made up of two components (the sensible heat of the flue gases) + (the latent heat of the water vapour which they contain). The second component normally represents about 10% of the gross calorific values of the gas. The percentage flue loss is given by the expression:

$$\frac{100}{\text{C.V. gross}} \left\{ \begin{array}{l} (T_2 - T_1)(p C_{\text{undiluted products}} + q C_{\text{air}}) \\ + (\text{C.V. gross} - \text{C.V. net}) \end{array} \right\}$$

where T_2 = flue temperature.
T_1 = room temperature.
p = volume of undiluted products per unit volume of gas burnt, correct to S.T.P.
q = volume of excess air per unit volume of gas burnt at S.T.P.
$C_{\text{undiluted products}}$ = specific heat per unit volume of the undiluted products of combustion.
C_{air} = specific heat of air.

For a normal town's gas of calorific value 500 B.Th.U. per

* From a paper before the London and Southern District Junior Gas Association, Feb. 16, 1934.

* From "The Calculation of Heat Transmission," by M. Fishenden and O. A. Saunders.

c.ft., and for flue temperatures ranging up to 1,200° F. this gives the equation

$$\text{Total flue loss\%} = \tfrac{1}{2}\left\{(T_2 - 60)(1{\cdot}013 + 0{\cdot}0186q) + 51{\cdot}5\right\}$$

From this formula it follows that the flue losses are a function of the two quantities (flue temperature) and (proportion of air in flue gases). The former may be measured and the latter may be obtained from the percentage of CO_2 in the flue gases by means of the expression

$$q = \frac{100 \times \text{vol. of } CO_2 \text{ produced per unit vol. of gas}}{CO_2\% \text{ in flue gases}} - \begin{pmatrix}\text{Vol. of dry products}\\ \text{of combustion per}\\ \text{unit volume of gas}\end{pmatrix}$$

Of all the forms of heat loss from gas appliances the flue losses are the most easily measured.

In industrial appliances where working temperatures often reach high values it is clear that flue losses may be considerable. At 1,000° F., for instance, and with 8% CO_2 in the flue gases, the flue losses are approximately 40%. In certain processes such as metal melting where the flue gases pass directly from the incandescent zone into the open, the effective flue temperature must be even higher than this. Under these circumstances it has become necessary to devise means of utilizing the heat of the flue gases, and for this purpose several methods are now available.

[The author concluded his paper by discussing the following: Recuperation and regeneration; preheating the load; flue gases for insulation; heat transmission within the appliances and indirect heating processes.]

Discussion.

The CHAIRMAN (Mr. H. C. Sims, South Metropolitan Gas Company), opening the discussion, thanked Mr. Lloyd for his interesting and instructive paper. He was sure there was a great field for the extension of the industrial load; the advantages of using gas for these purposes were, of course, that it was clean, easily applicable, and could be applied at the point where it was required. Mr. Lloyd seemed to show them that the use of gas for heating was rather more expensive than other methods, but in comparing it with other fuels one must take into consideration the drawbacks of other fuels. In the case of solid fuels there was the matter of storage and disposal of the resulting ashes and clinker. So ultimately gas would work out cheapest. The same applied to the use of oil, for in utilizing gas there would not be the same deterioration in the firebrick lining of the furnace.

Mr. C. A. MASTERMAN (Gas Light and Coke Company) remarked that the question of heat transfer was one of the most involved subjects, and it was a considerable testimony to Mr. Lloyd that it had not appeared so on that occasion. There was really no very considerable contrast between industrial and domestic applications of gas; they were both founded upon the same fundamental considerations. The difference arose in the industrial processes and the temperatures which had to be reached, involving considerations of refractories to obtain sufficient strength, together with the question of atmospheres, and, finally, the matter of throughput. What was meant by efficiency? asked Mr. Masterman; it seemed that Mr. Lloyd was concentrating over much on the thermal efficiency, which might be somewhat misleading. If as a result of the controllability and standardization of gas one could reduce the number of rejects, then one did increase the thermal efficiency, though on the definition put forward some degree of heat transfer would occur. Gas would ultimately show an increased efficiency by reason of a standardized product and a reduction in the number of rejects. By utilizing a polished cover on an apparatus, the thermal efficiency could be increased, and he thought he was right in saying that complaints had been put forward, where modern apparatus of this kind had been placed side by side with an old type black appliance, that the new one must be less efficient because it felt hotter to the touch. Actually that fact was due to there being less heat loss, and one had the apparent paradox of a higher efficiency combined with an appearance of waste.

Fins on Air Heater.

Mr. Masterman said he would like to refer to the air heater in connection with which Mr. Lloyd had emphasized the point of the fins on the outside of the tubes and had described the baffling arrangements. It appeared, however, that there was no similar device on the inside of the tubes to accelerate the heat transfer from the flue bricks to the wall. He might have made the outside simpler and the inside a little more complicated. The successful application of gas in these days depended upon the standardization of quality; and they were in the hands of the makers of the gas in so far as it could be relied upon. They were approaching a more and more technical era, and they could not afford to leave theory on one side. When dealing with industrial problems they had not merely to design the furnace to give a certain temperature, but they had to go further and examine the manufacturers' own problems and solve those problems for them. The manufacturer might come to see them in order to get a process done properly; it was not sufficient to give him what he asked for in the way of a particular temperature or condition. They must carry the process right through and see that the apparatus did its work properly —even if the information given them was sketchy and partly incorrect. They had to acquire a large amount of technique, and Mr. Masterman suggested, in conclusion, that another nineteen years be not allowed to elapse before the London and Southern District Junior Gas Association had another industrial paper.

Mr. L. T. MINCHIN (Gas Light and Coke Company) said that Mr. Lloyd had given a very interesting paper, which was of considerable interest not only in connection with industrial problems, but in many other branches of gas utilization. He was somewhat puzzled, however, by his remarks on the effect on flame radiation of closing in the combustion space. Would Mr. Lloyd kindly amplify this statement in his reply, since there appeared no particular reason why either the temperature or emissivity of the flames should be greatly increased in this way.

He also felt that the statement regarding the surface temperature of furnace casings was unintentionally misleading. Reference to Table 3 would show that a black surface at 100° F. lost heat as rapidly as an ideally polished surface at 140° F. (E = 0). All the heat conducted by the insulation must eventually be lost from the casing, so that the maximum reduction in temperature difference between outside and inside appeared to be about 40° F., which—on a high temperature furnace such as this—only represents a small proportion of the total difference, and therefore a corresponding reduction in the heat loss.

Mr. J. M. LOUGHLAND (Gas Light and Coke Company) congratulated Mr. Lloyd on having presented one of the finest papers on this subject that he had heard. They had used rule-of-thumb methods for many years, and he was able to assure Mr. Lloyd that theory was not divorced from practice, because they would not be obtaining the considerable industrial business they were to-day without the assistance of Mr. Lloyd. They had just completed a furnace for the annealing of three miles of aluminium foil; it was put on test the previous day, and he had not the slightest doubt that it would do its job perfectly. Such a job was one which would easily spoil. They were also dealing with the melting of 3 tons of wax in a pan weighing 16 tons; no flame could be applied in this case, and the only way to overcome the difficulty was the circulation of hot air. Such problems could not be carried through without the assistance of Mr. Lloyd, who was able to tell them what they could do and what they could not. He agreed that a gas furnace was just a " box of bricks " with a flame inside, but that was not all the story, and he had great hope for the future of industrial gas applications.

Burner Equipment Not Understood.

Mr. H. W. GROVER (Gas Light and Coke Company) said that in regard to Mr. Lloyd's introduction, he quite agreed that the theoretical aspect was very frequently neglected, and this applied particularly to plant engineers, &c., who thought it a simple matter to make their own equipment—*e.g.*, there were a very large number of rollers, platens, &c., which could be heated quite satisfactorily by town gas. This type of equipment appeared to call only for a piece of tube with a number of holes or saw-cuts, and they often found that gas had been condemned as being unsuitable for the job owing to the fact that the application of the burner equipment had not been sufficiently understood. They found the same state of affairs existing where it was required to heat solutions in tanks. In a very large percentage of cases they found the tank heated by badly designed burners, no attention at all being given to insulation and combustion. At the other end of the scale there were now many installations of a very complex character which seemed to belie the author's statement that a furnace was nothing more than a box of bricks with a flame inside. In fact, in some directions the technicalities of industrial fuel applications had been developed to a very fine pitch. The contrast between the old-fashioned applications and the new ones which were now being installed was in many cases so great as to make the older apparatus grotesque. There were numerous cases he would like to quote, but one example would, perhaps, be sufficient to illustrate his point. They recently had occasion to replace an old furnace which was being used for annealing milk churn stampings. The old furnace was fired by air-blast burners which required a complicated system of controls, including two fans, and was extremely difficult to regulate. It required three hours to reach working temperature and the full gas rate, which could hardly be reduced, was 1020 c.ft. per hour. The percentage of rejects was 6% to 7%. The new furnace was operated on low-pressure gas and was entirely controlled by an automatic temperature regulator. The heating-up time had been reduced to one hour, output increased by 30%, number of rejects reduced to less than 1%, while the full gas rate was 800 c.ft. per hour, with a maintenance rate of 300 c.ft. per hour.

The author's point about the difference between firebrick and semi-insulation brick was a very important one, as they had many cases where the re-bricking of a furnace had effected a decided improvement in the rate of heating and the maximum temperature of the furnace. The importance of this fact was often missed, not only by users, but also by appliance manufacturers. There was a tendency to use the heavy firebrick which was capable of standing temperatures up to 1500° C. for jobs where the maximum temperature likely to be encountered was less than 1000° C., and where the semi-insulation type of brick could have been used with success.

Flue Losses.

Mr. T. G. NOBLE (Gas Light and Coke Company) drew attention to Mr. Lloyd's statement that on small consumptions more air was drawn through. He meant, of course, more air per c.ft. of gas burnt. Mr. Lloyd had stated that flue losses were

the simplest losses to determine, and he would agree with this in general, but to arrive at the amount of the flue loss one had to take rather careful precautions owing to the variations in temperature. Mr. Lloyd had omitted to mention the fact that carbon monoxide, though normally negligible in amount, must be taken into consideration in industrial appliances where it might exist in greater quantities. In regard to the matter of fins, they had recently fitted these to an ordinary wash-boiler with an appreciable increase in efficiency. Equally important, of course, was the type of burner used on the appliance, and he would ask Mr. Lloyd to tell them something about specific types of burners for various work.

Mr. W. Dieterichs (Gas Light and Coke Company) said he thought Mr. Lloyd was to be congratulated on his very useful paper in connection with industrial gas heating. He was sure they were all interested in the demonstration he gave of the two types of brick used in furnace construction. It would not be out of place to go back perhaps two or three years to the time when they were investigating the small laboratory furnaces with a view to making some improvement in efficiency and appearance. The first experiments were made using ordinary gas fire fuel and very encouraging results were obtained. The brick they were looking for at the time was something like " Sorbo " rubber in texture. This, however, was not procurable at the time, and various bricks known as refractory insulators were tested. The first experiment was made on a furnace having a muffle 4 in. long by 2 in. wide by 2½ in. high, one furnace being constructed with the standard firebrick and the other with a refractory insulator. It was found that having the same gas rate, the temperature of 1000° C. could be obtained in ½ hour using the refractory insulator and 2½ hours using the standard firebrick.

About the same time as this development was taking place a certain consumer wrote to the Company suggesting that the present gas furnace used for assay work had been tested by their engineer, and it was found to be more expensive to use than an electric furnace, and after making a few inquiries it was found that an order for a considerable number of electric furnaces was about to be placed. The Company were given an opportunity of making their own tests, and they found that the cost of the existing gas furnace worked out at 7¼d. per hour against 5½d. per hour for the electric furnaces. It was pointed out to the consumer that they were comparing an obsolete gas furnace with one of the most modern electric furnaces, and they were given two months to develop something for the job. A furnace was subsequently developed in which the same low thermal capacity bricks were used and a recuperator was incorporated in the furnace. The result was that the modern gas furnace could do the same work as the electric furnace for 2¼d. per hour, and even these results had been improved.

Some time later developments were taking place in connection with salt baths and other industrial equipment, and similar results were obtained, but it must be remembered that a careful consideration must be given to the selection of refractories for any furnaces, as in some cases it was obviously important to have considerable heat storage in the brickwork of the furnace, particularly where heavy loads were placed in the furnace and a considerable drop in temperature was not desirable. Even in bakers' ovens, if sufficient thermal capacity was not allowed for in the design, when the oven was loaded the temperature would drop to such an extent the batch of bread would be spoilt. The same would, of course, apply to furnaces.

Preheating the Load.

Mr. Lloyd referred to preheating the load in connection with high speed steel furnaces. This did happen in effect, but Mr. Dieterichs was sure Mr. Lloyd would agree that the furnace was not designed in order to preheat the high-speed steel from an economy point of view. It would obviously be disastrous to place steel in a chamber at 1,300° C.; the preheating chamber was embodied in the furnace so that the operator could slowly heat the steel to a temperature of, say, 900° C. and then transfer to the high-temperature chamber. In some cases it was necessary to temper the high-speed steel, and by placing a third chamber in a high-speed steel furnace and using a brick damper it was possible to maintain the third chamber at approximately 650° C., the temperature at which high-speed steel could be tempered with quite good results.

The preheating of the load must not be overstressed. For instance, take a twin crucible furnace; one would naturally expect to find a considerable saving in fuel if the load were preheated in one chamber prior to being transferred to the hot chamber, but obviously it depended on the temperature of the preheated load, and it might surprise them to know that if, say, a 30-lb. crucible filled with granulated copper was placed into a furnace at 1,250° C. it reached a temperature of 600° C. in approximately 5 minutes.

Mr. W. L. Westbrook (North Middlesex Gas Company) asked if the webbed pan described by Mr. Lloyd was generally obtainable, as it was going to improve the efficiency of fish-frying tremendously. He also took it that the webbed hotplate was applicable to large catering ranges.

The Author's Reply.

Mr. Lloyd, replying to the points raised in the discussion, said he did not mean to suggest that gas was an expensive fuel to use; he intended to bring out that the price of gas at the meter was higher than the price of coal in the cellar. And he meant, indirectly, to give a pat on the back to his colleagues—and, incidentally, himself—for being able to overcome this price discrepancy by increasing the efficiency of the appliances they constructed. It was a remarkable fact that gas at 6d. per therm was seven times the cost of coal, and in spite of this they had been able to compete on a purely thermal basis with coal. In a specific case the cost of gas was only 20% higher with 600% difference in the cost of the raw material.

He fully realized the importance of the manufacturing efficiency to which Mr. Masterman had referred; such advantages as the reduction of rejects and so forth were very real factors in the choice of fuel, and with gas firing they were often able to show such advantages. The suggestion for fitting fins on the inside of the tubes of the air-heater was quite justified, but there were practical difficulties in regard to increasing the inside surfaces of the tubes, because the fitting of such ribs immediately caused the accumulation of dirt with consequent blockage of the flue, which had a disastrous effect on combustion efficiency. There were devices such as twisted bafflers to increase the heat transfer.

Flame Radiation.

In reply to Mr. Minchin, he said that what he desired to emphasize was that the heat radiated from a flame in the open was almost exclusively " flame radiation," whereas in an enclosed space a considerable amount of radiation was obtained from the hot gases outside the flame which would otherwise have been chilled by mixture with the excess air. Mr. Minchin's second point regarding the effect of the surface temperature of furnaces was one which he found somewhat difficult to explain, but he thought it would be agreed that if, on a given furnace, the temperature t_2—the temperature at the surface—could be increased, the heat flowing through the wall would be decreased. The reference to the temperatures of 140°-100° F. was unfortunately not applicable to the case in question, as the surface temperatures reached considerably higher valves at which the importance of radiation was correspondingly greater.

Mr. Lloyd said he was grateful to Mr. Loughland for having shown them some other aspects of industrial heating problems and for indicating how they appeared in practice. He was conscious of having put before them a lot of dry facts and figures, whereas the subject was really very fascinating and varied; one came up against fresh problems almost every day.

In regard to Mr. Noble's remarks, Mr. Lloyd affirmed that what he said about the increased air when the burner was turned down was, as suggested, intended to imply an increased proportion of air to the gas consumed. He had deliberately omitted to mention the matter of carbon monoxide formation as affecting flue losses, but it was a fact, of course, that it did have an effect on the losses, because it meant that a certain amount of potential heat was passing up the flue. He left it out because it was difficult to estimate what the heat loss was. They knew carbon monoxide was always associated with a certain amount of hydrogen, and the latter was generally an unknown factor. The amount of heat loss through the presence of 1% of carbon monoxide in the flue was a surprisingly small quantity—in the region of 2·5% of the total heat input.

Choice of Burner.

The question of the choice of a suitable burner was extraordinarily interesting, but it was a very wide subject; so perhaps Mr. Noble would excuse him if he did not embark on it then. His results with wash coppers were very interesting, and on the industrial side they found the same sort of thing. The use of a hot flame inside the furnace made it easier to obtain a high temperature. An air-blast burner was, of course, really just a super Méker burner.

He was sure they were all interested in what Mr. Dieterichs had told them about the muffle furnaces. There was much more he could have told them concerning the developments of these modern gas appliances for industrial heating, because he was primarily responsible for their development.

In reply to Mr. Westbrook, he stated that the fish-frying apparatus was not actually on the market, but it was obtainable, while the hotplate was manufactured by Messrs. Benham & Sons, Ltd.

Vote of Thanks.

Mr. F. C. Smith (Gas Light and Coke Company), the Senior Vice-President, proposing a vote of thanks to Mr. Lloyd, said that the paper was one of very great interest for three reasons. First, he thought it was undoubtedly a paper to present to this Association because the duties of a large number of the members were primarily associated with the gas-works, and the fundamental facts to which Mr. Lloyd had referred were just as applicable to the works. Secondly, industrial gas had a great future; and for some nineteen years this Association appeared to have neglected the subject until Mr. Lloyd had brought it before them. And, thirdly, he always liked to hear Mr. Lloyd, because he was so refreshingly frank. Gas was peculiarly applicable to the industrial world, concluded Mr. Smith, because of its ease of control, with no necessity for storage, and on account of its consistent quality.

Mr. J. M. Webber (Croydon), the Junior Vice-President, seconded the vote of thanks, remarking that he was afraid that on this occasion the works men were seen rather than heard; but, he added, he could not allow Mr. Masterman to go away without some reply to his reference to variations in the quality of the gas produced. He could assure him on behalf of the other manufacturing men present that their gas never varied.

Benzole Washing of Coal Gas from Horizontal Retorts*

By H. G. Davison, of Chester.

The following is a brief description of the de-benzolizing plant in operation at Chester, an account of the method of working adopted, and a summary of the results obtained and operating costs incurred over a period of six months ended Dec. 31, 1933.

The gas-making plant consists of horizontal retorts making 500 B.Th.U. gas, and a carburetted water gas plant, the declared calorific value of the gas sent out being 475 B.Th.U. The total make of gas for 1933 was 473,500,000 c.ft.

The oil washing plant is situated at the outlet of the coal gas purifiers. It is a rotary brush washer-scrubber of Messrs. W. C. Holmes & Co.'s well-known type, and was installed in 1925 as a naphthalene washer. It is now efficiently working as both naphthalene and crude benzole washer.

A de-benzolizing plant was added last spring by the Chemical Engineering and Wilton's Patent Furnace Company and started up on June 9. The guaranteed production was 180 gallons per day of 70 to 75% at 120° C. crude benzole when carbonizing 120 tons of coal per day and circulating 200 gallons of wash oil per hour. These figures have been easily exceeded, our average production over six months being 2·03 gallons per ton of coal, and, more recently, 2·50 gallons, with an average rate of oil circulation of about 140 gallons per hour and a maximum daily carbonization of 100 tons of coal.

De-Benzolizing Plant.

A rotary circulating pump, chain driven from the washer engine shaft, delivers benzolized oil from a well to an overhead feed funnel fitted with feed regulation cock. The oil flows by gravity to a tubular oil-to-oil exchange heater, surplus oil returning to the well and being used to wash the ascending stream of foul gases from the various plant vents. A temperature of about 65° C. is reached in the heat exchanger, and final heating to 135° C. is carried out in a steam heater consisting of a cylindrical steel vessel containing a steam coil. From the top of the steam heater the oil is passed to the top of the stripping still which has ten cast-iron sections each 2 ft. in diameter. Live steam is applied at the bottom of the still through a reducing valve at 25 lbs. per sq. in., the de-benzolized oil leaving the still at a temperature of 115° C. and passing through the heat exchanger already mentioned before entering a water-tube cooler at 55° C. In the cooler, water flows counter-current to the oil which is cooled to a temperature of about 5° F. above the gas temperature at the oil washer inlet. From the outlet of the cooler the oil returns direct to the gas outlet end of the oil washer.

The vapours leaving the top of the stripping still are passed to a fractionating column of 6 cast-iron sections each 1 ft. 6 in. diameter and surmounted by a water cooled reflux condenser, the water supply to which is thermostatically controlled, the benzole vapours and steam leaving at 84° C. A water cooled coil condenser liquifies the vapours which then flow to an automatic separator via a sight glass. A similar separator at the bottom of the fractionating column deals with the naphthalene fraction. The still and fractionating column are lagged with asbestos mattresses. Steam is supplied at 50 lbs. per sq. in. from breeze fired Cornish boilers, and water is taken from the works supply which is pumped from the adjoining River Dee. The wash oil used is gas oil of Roumanian origin and has a Sp. Gr. of 0·860, the distillation test showing first drop at 190° C. and 90% over at 340° C.

Operation.

The rate of oil circulation is adjusted according to the volume of gas passing and the degree of stripping desired. New gas oil is added continuously at the rate of about 0·6 gallon per gallon of crude benzole made, the surplus of benzolized oil being regularly pumped to the carburetted water gas plant oil storage tank which receives the naphthalene fraction also. The crude benzole gravitates to a well from which it is pumped into road tanks for removal to the refiners.

Steam and water supplies are regulated to maintain the correct plant temperatures and to provide the desired stripping efficiency and benzole quality. Run-off cocks are provided at suitable points, and any accumulation of water is removed by means of these daily. The plant works continuously and automatically, but adjustments are necessary for variations of gas volume and atmospheric temperature.

Sludging of the wash oil has caused a stoppage for cleaning out to be made on two occasions. The sludge appears to be an emulsion of oil and water which deposits in the exchange heater and oil cooler and impairs their efficiency, its presence being noticeable by a gradual rise in the oil cooler outlet temperature. Little trouble has been caused, however, as the sludge is easily removed by emptying the plant vessels into the benzolized oil well and applying steam to the exchange heater and oil cooler. The deposit is then collected from the run-off cocks and afterwards passed through the carburetted water gas plant tar separators. The cleaning-out process takes about ten hours.

Average results of tests on the oil in circulation are as follows:

Benzolized oil (first drop) at 90° C., 6% at 160° C. Sp.gr., 0·870
De-benzolized oil (first drop) at 180° C., 2% at 200° C. Sp.gr., 0·871.

Working Results.

The figures given below are totals and averages for the period of six months ended Dec. 31, 1933.

Crude benzole made (79% at 120° C., sp.gr., 0·857)	25,666 galls.
,, ,, ,, per ton of coal carbonized	2·03 ,,
Naphthalene fraction made (4% at 160° C., sp.gr., 0·853)	4·721 ,,
Naphthalene fraction per ton of coal carbonized	0·37 ,,
Proportion of benzole to naphthalene fraction	5·44 to 1
Gas oil added to circulation	14,916 galls.
,, per gall. crude benzole made	0·58 ,,
,, lost in washing	5.260 ,,
,, lost in washing per gall. crude benzole made	0·20 ,,
Steam consumption crude benzole made	30 lbs. approx.
Water consumption crude benzole made	57 galls. approx
Reduction in coal gas C.V. per gall. benzole	9 B.Th.U. ,,

Operating Costs of Production.

The following table of costs is limited to those pertaining to actual operation and does not include the price at which gaseous therms are charged to the recovery plant. Charges for interest and depreciation do not include the washer and existing storage tanks, as this apparatus was in operation for naphthalene washing before the installation of the benzole plant.

—	Total for Half Year. £ s. d.	Per Gallon Crude Benzole. d.
Gas oil lost, 5,260 galls. at 4½d. per gall.	95 18 0	0·897
Less naphthalene fraction made, 4,721 galls. at 3d. per gall..	59 0 0	0·552
	36 18 0	0·345
Steam and water pumping	79 1 0	0·739
Labour	35 5 0	0·329
Interest and depreciation	29 6 0	0·274
	£180 10 0	1·687

Effect on Composition of Gas.

Since the commencement of benzole extraction there has been a steady decrease in the sulphur compounds content in the gas delivered to the district. For the last three months of 1933, compared with the same period in 1932, the average tests show a drop from 22 to 15·6 grains per 100 c.ft., the proportion of coal gas to carburetted water gas having been about the same. The naphthalene content remains unaltered at about 0·6 grain per 100 c.ft.

Discussion.

The President (Mr. H. T. Williams) remarked upon the guaranteed production of 180 gallons per day of 70 to 75% at 120° crude benzole having been exceeded, with 20 tons of coal a day less than specified. He thought the quality of benzole was good. The washer appeared to be very efficient, and as a naphthalene extractor it must be advantageous in that respect alone. The steam consumption was low, which was a further proof of the excellent lagging and plant efficiency.

Mr. J. Albinson (Manchester) thought that all gas-works should practise benzole washing, as it made the operator look after the whole of the gas-making plant, to keep up its efficiency by reason of the stripping.

Mr. F. N. Booth (Wallasey) thought the labour costs were very low, and asked what they included.

Mr. Davison replied that all labour costs were included. The

* Paper before the Manchester and District Junior Gas Association, Chester, Feb. 10, 1934.

work on the plant was done by the ordinary workmen on the works; there was no man detailed specially to look after this particular plant as benzole operator.

Mr. LEATHER (Burnley) asked if they had any trouble with the thermostat.

Mr. DAVISON replied that it had worked without any trouble.

Mr. BOOTH asked if the author had noticed any deposit on the governor or district since the plant had been working.

Mr. DAVISON said it was too early yet to see whether there would be any such trouble; it might possibly arise later.

Mr. H. PLATT (Bolton) asked if the costs included water.

Mr. DAVISON said the only cost for water was pumping of the river water; otherwise the costs would have been greater.

Mr. N. PARTINGTON (Oldham) asked whether, when new gas oil was added, it improved efficiency.

Mr. DAVISON replied that there was no noticeable effect.

A New Recording Gas Calorimeter*

By WILLIAM MASTERTON, B.Sc., Tech., Granton Gas-Works.

I would like to indicate the general principles of instrument design which I adopted before designing any part of my own instrument. These principles were for the most part clearly formulated by Prof. Boys in his address to the Institution of Gas Engineers at the meeting in 1922.

In the first place he is opposed—and I consider rightly so—to the use of any inferential components, apparatus depending on "the operation of natural law." He referred to recorders in which water flow is measured by inference, by the rate of discharge of water through an orifice. Prof. Boys accordingly avoided any such method of measurement, preferring the method of a tipping bucket, delivering a clean-cut quantity of water at each tipping.

A second quality in high-class scientific measuring apparatus is the absence of what he termed "persuasive push," as exemplified in air thermometers. I do not desire to belittle the work of the pioneers in the line—that of the late John F. Simmance, who first used aneroids for this purpose, nor yet that of those who introduced such ingenious improvements in this system, but I do consider it unfortunate that so much inventive energy should have been expended upon developing and improving a principle of such questionable nature. It is significant that the modern forms of the two instruments formerly using aneroids now use other methods of thermometric measurement. I think progress in the instrument-making side of our Industry would have been more rapid if the inventors had from the beginning resolutely refrained from using any devices which were fundamentally of doubtful value.

When I come to describe by own instrument you will observe that every component is of scientific as opposed to inferential nature, and no component can be described as exerting merely a "persuasive push."

A third quality is demonstrated in an instrument which hailed originally from America. I refer to the Thomas calorimeter, in which every component is not merely the "performing" but is also the ultimate "measuring" component. To make the matter clearer, a tipping bucket delivers a precise quantity of water at each tipping, but the bucket itself is not the measure of the water being delivered. The water has to be measured in a measuring jar or be weighed and the tipping point of the bucket adjusted accordingly. In the case of the Thomas each performing and ultimate measuring component are one and the same piece of apparatus. There is therefore not the necessity for duplication of apparatus in the instrument.

Unfortunately, in the case of the Thomas, the heat interchanger is not of an officially approved type. Consequently, for official purposes, an independent Boys testing set is provided to act as a standard by which the readings of the Thomas are corrected. In my own instrument I have kept as close as possible to the apparatus of the officially approved hand-testing outfits, and have managed to reduce duplication of apparatus to a minimum.

A further matter which I consider other designers have entirely neglected is the avoidance of delicate scientific precision apparatus. Such apparatus has two disadvantages, and more robust and simpler apparatus can accomplish the desired end at least equally well. In the first place, such apparatus is costly, and in the second place, it requires to be well made to be accurate. Even if originally well made it generally deteriorates under the arduous conditions of the works

I am in a position to offer the Industry a recording calorimeter in which check testing is all but abolished, a recording calorimeter the automatic results of which are necessarily identical with those which would be obtained by a manual operator.

GENERAL OUTLINE OF THE INSTRUMENT.

The heat interchanger is the standard Boys calorimeter. The meter is of standard pattern, being a Boys bell meter or Hyde meter. As in the manual testing apparatus the rate of rotation of the meter is not controlled by any mechanical means. Thus the fundamental components are exactly those of the annual testing outfit. The other components which relate to water measurement, gas volume factor measurement, and temperature measurement, are performed by means which can perhaps be best characterized by the term "orthodox." For water measurement a calibrated vessel is filled and emptied to a definite point. Gas volume factor is given by an air-filled bell. Temperature measurement is effected by toluene-mercury thermometers. Thus the entire instrument is constructed either of officially approved apparatus or other very orthodox apparatus closely related to apparatus which is officially approved. When I have described the instrument I think all concerned with gas calorimetry will agree that this recording calorimeter is the nearest approach yet made to the automatic performing of a C.V. test.

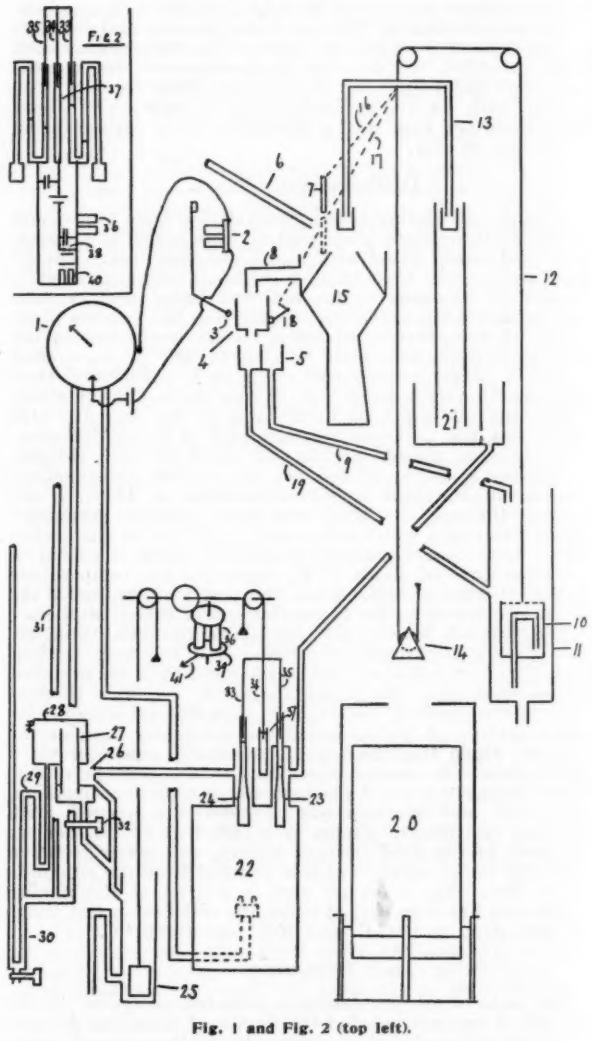


Fig. 1 and Fig. 2 (top left).

The gas meter, working at its natural rate—*i.e.*, without any impediment on its revolution—completes a momentary electric circuit once per revolution. This initiates the operation of the water-measuring device which "races"

* From a paper before the Scottish Junior Gas Association (Eastern District), Feb. 17, 1934.

through its work and then " waits " for the next revolution of the meter to commence. Thus the water measurement is kept " in step " with gas measurement.

In the water-measuring device a vessel is filled to overflowing with water. The supply of water is then cut off from the vessel and an ever-ready syphon is lowered into it, so discharging its contents to whatever depth the syphon is lowered. This depth is dictated by the height at the particular time, taken by a bell containing a fixed quantity of air sealed over water. The enclosed air is under the same tabular conditions as the gas being measured. Hence the prevailing tabular number as given by the bell controls the depth to which the syphon discharges the water vessel. The water flow being varied to compensate for tabular number and the operation of the water-measuring device being kept " in step " with the gas meter, the temperature rise between inlet and outlet of calorimeter measures the calorific value.

Two toluene-mercury thermometers are provided, one in the inlet and the other in the outlet. Two needles held together descend the bores of the thermometers. The needle in the outlet thermometer touches the mercury first and the needle in inlet thermometer contacts at a later point in the descent. The making of the first contact begins, and the making of the second contact terminates, the excitation of an electro-magnet, which all the while is moving in sympathy with the needles. The electro-magnet being excited for a distance of its travel corresponding to the temperature difference between the two thermometers, this distance is measured off by a suitable armature which partakes of the motion of the electro-magnet as long as the latter is excited.

I would like here to point out an advantage in my thermometer system. Others have used thermometers based on different methods—aneroids, thermocouples, electrical resistances—but in mine the actual operative thermometer is simply an " orthodox " or " primitive " type thermometer made automatic. The advantage of this (apart from the fact that it is more fundamental and simple) is that it is free from any of those complicated and costly compensations which other types have to use to cut out the effects in some approximate manner of the various other variable factors which influence their accuracy—such as barometer and atmospheric temperature variations, inlet water temperature variations, and unequal scale effects in the current measuring parts.

In the automatic form of the primitive thermometer no action takes place until the needle contacts, and when it contacts it performs immediately all it is going to do. There are no uncertain or ill-defined factors interfering with its performance.

I once heard Prof. Henry Briggs lecture on coal cleaning methods. He described the various methods historically and remarked that the developments of such methods had passed through a cycle and the best process we had arrived at was a modernized version of the most primitive. He observed that this was a very general occurrence, and I submit that this recording calorimeter is the nearest approach to a modern version of the old hand-testing outfit.

The calorimeter is supplied with a safety device (1) to cut off gas supply in the event of failure of the water supply, (2) to cut off gas supply in case of temporary failure of gas pressure.

The power to operate the water-measuring device is obtained from the water supply to the instrument. A small vessel constructed on the " cup of Tantalus " principle is suspended from a chain. Water entering the vessel increases its effective weight so that it descends, thereby pulling up the syphon tube. When this is pulled up the water supply fills the water measuring vessel, there being none now running to the small power vessel. When measure is full and overflowing, the water again goes to power vessel, primes its syphon so that it empties, and, being light, it rises while the syphon tube descends into the measure. The power vessel cannot receive any more water and so cannot perform its next down-stroke until the completion of the revolution of the gas meter causes an electric circuit to switch over the water supply to the power vessel.

Cycle of Operations of Tabular-Controlled Water Supply.

When the index of the gas meter (1) comes to the six o'clock position it momentarily completes an electric circuit which causes the water measuring device to go into operation. The completion of the circuit excites the magnet (2) which by the hammer (3) knocks the swivelling cup (4) into its right-hand position so that water passes into the right hand partition of cup (5). The water supply issues from tube (6), is baffled by plate (7) in its lower (dotted) position, passes by the tube (8) to swivelling cup (4), thence via tube (9) to the power vessel (10). When this is, say, half full of water it descends to the bottom of sleeve (11), and by chain (12) pulls up the ever-ready syphon (13) together with pulley-weight (14). When syphon tube is clear of water vessel (15) the last few inches of movement take up the slack in chains (16) and (17), thereby raising plate (7) so that water now enters the vessel (15) and also raising an angled lever (18) which throws over swivelling cup (4) to its left-hand position. All the water from supply (6) is now entering vessel (15) until it overflows. The overflow water passes via tube (8) to swivelling cup (4), thence via tube (19) to the power vessel (10) at present in its lower position in sleeve (11). This causes the syphon in the power vessel to become primed. The vessel empties, and now being light it rises, and the syphon tube (13) and pulley weight (14) descend. The descent of the pulley weight and syphon tube ceases at the point where the pulley weight rests on the bell (20). The syphon is now discharging water from the vessel to whatever depth is dictated by the height of the bell.

The cycle of operations of the water measuring device is completed more quickly than the revolution of the gas meter, so that the water measuring device is now at rest and cannot again operate until the signal is given by the meter index coming to the six o'clock position. Thus it is obvious that the operation of gas and water measurement are necessarily in step.

The water is thus doled in " consignments." The flow is made smooth by passage through a water anti-fluctuator (21) which is simply a box of four compartments connected by small holes so that by the time the water has reached the last compartment it does so as a steady flow suitable to pass to the calorimeter (22).

The water flow passes the inlet thermometer (23) and issues from the calorimeter passing the outlet thermometer (24). It then passes through the safety device, and from there it goes to the vessel (25) which is a " cup of Tantalus " providing power to operate the thermometer. The " cup of Tantalus " and sleeve (11) both deliver to drain.

Operation of Safety Device.

The operation of the safety device is briefly as follows. In the event of water supply failure the cup (26) runs dry through the small hole in the bottom. Tube (27) likewise empties itself, and the water contained in reservoir (28) runs down the tube (29) into **U** tube (30), thereby cutting off the gas supply to the meter and preventing damage to the calorimeter.

The safety device also covers the emergency in which the gas supply is cut off and turned on again, thereby causing an escape of gas. When the gas is cut off the **U** tube (30) is again blocked so that no escape takes place either from the calorimeter burner or the " bleeder " burners which burn off pipe (31). The co-axial tap (32) also ensures that the device is foolproof. If the gas is turned on to the calorimeter, the safety device is in position to operate if called upon to do so.

The Recording Thermometer.

For the sake of clearness the thermometers have been shown as single stem thermometers in fig. 1, but they are in reality double liquid thermometers—toluene-mercury or amyl alcohol-mercury as shown in fig. 2, which is a diagram of the electrical connections of the recording thermometer. Mercury is not suitable as the expanding liquid in these thermometers on account of its low co-efficient of expansion, but its use is necessary in the bore of the thermometer for the purpose of making electric contact. The three needles (33), (34), and (35) descend while the electro-magnet (36) rotates at a proportional angular rate.

Needle (33) moves up and down in the bore of the outlet thermometer, needle (35) in inlet thermometer while needle (34) moves in tube (37) which contains mercury and forms a convenient terminal for the supply of current. In the descending stroke needle (33) makes contact with the mercury in the outlet thermometer and completes a circuit as shown in fig. 2, the current flowing through the magnet (36) and switch (38). The rotating magnet is now excited and picks up the circular plate or armature (39) so that the latter is now rotated also. When the needle (35) makes contact with the mercury in the inlet thermometer a circuit is completed as shown in fig. 2 whereby a second magnet (40), not shown in fig. 1, is excited. This magnet being excited it throws over the switch (38), so that both circuits —the outlet and its own (inlet) circuit—are now broken. Magnet (36) therefore loses its excitation and drops the armature (39) at the moment that the inlet thermometer contact is made. Hence the armature has been rotated through an angle which is proportional to the difference in level between inlet and outlet thermometers. This distance measures the C.V. and is suitably indicated by a dot being made on a chart by the pen (41) which is suitably attached to the armature. The dot being repeated at intervals of about one minute they merge to form a continuous line.

While I designed this recording thermometer originally

for the purposes of the calorimeter its use can be very much wider. It can be arranged as a single, instead of a differential, thermometer. As such it should find considerable use in industry. I consider that the principle of exploring needle moving in sympathy with an electro-magnet marks a definite advance in industrial temperature measurement.

With regard to my recording calorimeter, the price of which it is too early yet to assess, I consider I have brought a high-class scientific instrument for the first time within the purchasing power of the smaller undertakings. None of the scientific class is so simple or so cheap as mine is likely to prove. There are some inferential instruments which are probaly cheaper, but these have only a fictitious cheapness, as a separate hand-testing set has to be provided to check them.

In these days of increasing electrical competition I think it should prove specially advantageous to the smaller undertakings to be able to guarantee a steady quality of their gas by simple and cheap means.

The various components of the apparatus are highly accurate. The tabular control which has been under observation for some time always reads identically with the Gas Volume Factor as obtained from readings of barometer and thermometer. The water measure delivers water accurate to 0·5 c.c. in 500 c.c., or one-tenth of 1%. Future models will be even more accurate, as a neck will be provided at the entrance of the water measure, thus making the point of commencement of syphoning still more definite. Even as it stands, however, this measuring device is equal in accuracy to the standard measuring jars at present used in hand testing. Such a method of water measurement, being scientific and not inferential, gives one the most confidence where the water is of the quality as supplied in most towns.

The gas meter being of standard type, a pre-saturator being used to facilitate preservation of water level, and the meter being necessarily in " step " with water measurement, there is no appreciable error in this component, the amount of water lining error in such arangements being small.

The thermometer has only just been completed in its final form. Consequently I am not in a position to report on its behaviour over any period of time. I can, however, say that it functions satisfactorily, immediately lifting and immediately dropping the armature on making the respective contacts.

In conclusion I thank Mr. Harry H. Gracie and Mr. James Jamieson for their kind permission to construct and work out the apparatus at Granton.

Discussion.

The VICE-PRESIDENT (Mr. Sydney Smith, Dunfermline) occupied the chair, and in opening the discussion, said he thought that Mr. Masterton's instrument was a definite advance in the design of recording calorimeters. It was the result of much careful thought and was a masterpiece of mechanical ingenuity. His first thought was the complicated nature of the apparatus and the multiplicity of components, but the principle appeared to be sound, and damage from failure of gas or water supply was effectively prevented by the automatic cut-off. The positive method of tubular connection commended itself.

Mr. J. M. DOW (Kirkcaldy) hoped that the recording calorimeter would be available at a price suitable for small undertakings. He was of the opinion that, should any fault develop, it would not be easily remedied by a non-technical person. He asked how the discrepancy between air and gas temperature was allowed for and what was the efficiency when compared with the Boys instrument. He observed that the water was measured by volume whereas the Gas Referees recommended weighing of water.

Mr. COWIE, Jnr. (Hawick), commended Mr. Masterton on the thorough methods he had adopted in designing his instrument and the comprehensive knowledge he had displayed in the subject of calorimetry, and hoped that his instrument would be put on the market.

Mr. A. C. REA (Edinburgh) said that, in viewing the instrument from a mechanical point of view, it appeared that there were many mechanisms which might get out of order. He asked in what way would the stretching of the chains connecting the syphon and thermometers affect the accuracy of the instrument; also how the electrical apparatus would stand in atmospheres found in gas-works.

Mr. MASTERTON, replying, said that the Boys instrument incorporated in his apparatus could be used as an independent testing instrument with a few alterations, but he did not think that this would be allowed by the Referees, if the instrument were adopted by them. Every part of the recorder, except the tubular column, could be independently checked. Mr. Dow had raised the point of correction for air and gas temperature differences. The error due to this difference was small and nearly constant, and in order to reduce costs he (the speaker) did not propose complicating the apparatus and also increasing the price when only about 2 B.Th.U. were involved. The recording pen could be set to compensate for this. The whole instrument would be totally enclosed and so help to maintain a fairly close gas and air temperature. It occupied a space of 6 ft. 6 in. by 3 ft. by 12 in. The whole mechanism was robust and easy to operate, contained no delicate parts, and in manufacture did not require to be skilfully made to give highly accurate results. A weekly check would reveal any discrepancies due to mechanical changes, and these could be allowed for by adjustment. The electric contact points were made of enamel and were therefore not affected by fumes.

Hire-Purchase Problems

By A. V. BISHOP, of Ipswich.

There is no doubt that the development of hire-purchase of gas apparatus during the past few years has been the means of attracting a huge volume of business which might otherwise not have been secured. Most gas undertakings of any size now offer the latest cookers, coppers, fires, water heaters, &c., on very easy terms, and this business has brought problems which demand consideration.

One of the problems which the Industry is being called upon to face to a rapidly increasing extent is that of removals. Certain classes of people—civil servants, insurance officials, bank officials, clergy, business representatives, and so on—are liable to move from one district to another at intervals, and at times unexpectedly. It often happens that a customer of this type is moved from a district when he has paid about half the instalments on a gas appliance. A difficulty then arises. For obvious reasons the undertaking concerned is reluctant to allow the appliance to leave the district under its control without adequate safeguards, and the customer is equally reluctant to lose the amount of the instalments he has paid. Unfortunately, and it is easy to understand when one contemplates the cost of removals, the customer frequently finds it inconvenient to pay the balance in a lump sum.

The obvious solution is for the gas undertaking in the district to which the consumer is moving to take over the liability and collect the instalments when they fall due. It is assumed, of course, that the customer has faithfully met his previous obligations.

The Company with which the writer is associated has recently had a number of problems of this kind to deal with from both angles—those of buyer and seller.

With some undertakings no difficulty has been experienced in coming to agreement, and the general basis has been that the undertaking buys the appliance from the vendor company at cost price less the amount paid off after allowing interest at the rate originally charged by the seller. Sometimes the interest includes a certain amount of profit on the appliance.

In other words, the undertaking accepting the liability take it over at a price which allows them the interest charges on the amount outstanding, *plus*, sometimes, a proportion of the profit on the appliance.

When two undertakings agree to a proposal of this kind no difficulty arises, and the goodwill of the customer is retained for gas. In fact, the writer has generally found the consumers very grateful for the trouble taken to get them out of the difficulty, and contact made under such conditions often leads to further profitable business.

There are some undertakings, however, which for various reasons seem reluctant to engage in such deals, mutually advantageous as they must be in the long run. The unfortunate customer is then faced with two alternatives—to lose the money he has paid, or to pay cash. As has been pointed out, the latter method is often very inconvenient. The alternative loss of money definitely puts the consumer against gas, and, willing as the undertaking in the new district may be to do business, if the consumer has lost money on a previous hire-purchase arrangement with a gas undertaking, prospects for gas are definitely less good.

I am personally at a loss to understand the attitude of some undertakings in refusing to sell their liabilities to other undertakings. Surely they have nothing to lose. The refusal to undertake a liability one can more easily understand, even if one does not agree with the attitude. After all, the risk of default is usually even smaller than the average, because one has the information that the buyer has met previous payments.

Surely it is possible for a more or less national agreement to be arrived at on this matter in the interests of both consumers and the Gas Industry.

Lea Bridge District Gas Company

ANNUAL GENERAL MEETING

The Annual Ordinary General Meeting of the Lea Bridge District Gas Company was held at the Offices of the Company, 63 and 64, Chancery Lane, W.C. 2, on Tuesday, Feb. 27, 1934—Mr. ARTHUR M. PADDON, M.Inst.C.E. (Chairman of Directors), presiding.

The SECRETARY (Mr. Norman H. Davies, A.C.A.) read the notice convening the meeting, after which the seal was affixed to the register of stockholders.

The report and accounts were taken as read.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said that before calling their attention to the accounts he would refer in the first instance to paragraph 5 of the report, in which was recorded the great loss which the Company had sustained in the decease of Mr. F. W. Cross. The Chairman said he had been associated with Mr. Cross in one way or another for nearly forty years, and certainly since he first assumed office in the service of this Company. He had therefore been privileged to observe his careful, skilful, and assiduous attention to all the interests of the undertaking. So far as one man could be called such, Mr. Cross might be termed the great architect of the Company's satisfactory position today. They had all lost a very old and valued friend.

It would be seen that their Secretary, Mr. Hand, had also left them, but, fortunately, for totally different reasons—namely, to commence well-earned retirement after a long term of service. The Assistant Secretary, Mr. Norman H. Davies, had been appointed his successor, and he had shown every attention to the discharge of his duties.

Since the report had been printed they had learnt of the death of Mr. R. E. Gisburne, who had been for many years one of their Auditors, and had in that capacity acted in protection alike of the proprietors and administration.

The second paragraph of the report told them that they had a small decrease of 1·2% in the volume of gas disposed of, and in this respect they were fortunate in comparison with many other undertakings. This decrease was attributable almost entirely to the general depression, and for the moment they could see no signs of much improvement in this regard. There was a further reason why conditions could not improve, and that was because they still had to contend with abnormally high taxation, until which burden was lifted they could not hope for a renewal of commercial or industrial activity.

CAPITAL PER MILLION.

Turning to the accounts, the Chairman said that statements A and B of capital (stock) and loan capital showed no change in comparison with the previous year. In regard to the capital account, they would observe that a sum of £27,446 had been expended during the year, which was reduced by the application of depreciation by £13,130, so that they had incurred a net increase in capital of just over £14,000. This brought their capital per million c.ft. of gas sold, in relation to the total capital expenditure of £502,897, to £490. This figure was higher than in previous years, and higher than they liked it to be, but until they got some further increase in the Company's business, a reduction in this figure was difficult. If, however, they looked on the other side of the capital account it would be seen that they were over-spent by £55,855; and, therefore, computing the amount of capital as £450,118 on which they had to pay dividend and interest, and a small loan of £2,000 from their bankers, which appeared on the balance-sheet, the capital per million c.ft. was reduced to £440—a much more favourable figure, and not at all discreditable to a company of this size, having regard to the efficiency of their works and the fact that they had very little to depreciate.

On the credit side of the revenue account, it would be seen that receipts from the sale of gas, and rental of meters, stoves, and fittings, had decreased by £4,500, which was only qualified by a very small improvement from the sale of residuals. This left a total decrease of £4,137. Coming to the other side of this account, they found that coal had cost them about £2,500 less, but oil and coke together cost £2,252 more, which was more than accounted for by the duty on imported oil, amounting to £2,437.

This raised the rather interesting point as to whether the imposition of this duty had been of any practical benefit to the Gas Industry, because the Gas Industry prompted the Chancellor of the Exchequer to impose the duty. It might have done the coal people some good, but it had not done the Gas Industry any good. It was a very self-sacrificing ordinance when the Industry asked for this duty. So far as the Lea Bridge Company was concerned, the Chairman considered that they would have been rather more satisfied if things had been left as they were.

Other items in the revenue account showed very little difference. In regard to the benefit fund, he would refer to this item because it was the last time they would see it. This benefit fund would be merged into a new disposition under the authority of a Board of Trade Order for which they were applying, which would also deal with the question of pensions on a new contributory basis. When this was done they would incur a certain liability to make the fund stable from an actuarial point of view, so that the benefit fund would not be seen again.

The net result of this part of the account was that they had spent £1,245 more and received £4,137 less, so that the total reduction of profit was £5,383. This sum was, nevertheless, ample for all their purposes and provided a certain supplementation to the balance they carried forward.

PROVISION FOR FUTURE DIVIDENDS.

In the profit and loss account it would be seen that they had brought in £40,154, and when they had paid the dividend and all necessary appropriations they would carry forward the sum of £40,692, or £538 more than they brought in, which must be considered very satisfactory. Looking at the reserve fund, it would be observed that this was practically entirely invested; but the gist of the statement was that it contained an amount sufficient for the dividends for two-and-a-half years ahead. Not many companies were so amply provided for as regards future dividends.

They had £25,000 invested out of £31,000 in the special purposes fund account, which was a high percentage. In regard to the benefit fund, they had transferred £1,660 from the revenue account, and the fund which is fully invested now stood at £10,189 15s. 3d. This sum would be very useful when they reconstituted the fund under the new conditions. There was one very satisfactory figure in the balance-sheet, which showed the book value of their investments as totalling nearly £96,000; but if they looked at the note below it would be seen that they had a market value of nearly £120,000 by reason of the appreciation in investments. On the other side there was only a small loan from their bankers, of which he had spoken, and also the rather handsome provision for the renewal of their vertical retorts. This was consequent upon the fact that they had no renewal fund—a fund they were proposing to provide if sanctioned by the Board of Trade in their current Application.

The Chairman thought that the accounts might be summarized as satisfactory, connected as they were with a period which had given very little encouragement. They had done fairly well during the current year, being slightly ahead at the present time, and there was no reason why they should not maintain that position.

Theirs, said the Chairman in conclusion, was not an opulent area of supply, and gas was more of a necessity than in some of the more favoured areas around them. The economics of gas were more understood in their district as a result of the prepayment system, and their output did not rise and fall in the mercurial way of that of some other undertakings, for the reason that the people had not the money to spend, and when they had it they did not spend it on gas.

The CHAIRMAN then formally moved the adoption of the Directors' report and statement of accounts.

The DEPUTY-CHAIRMAN (Mr. G. W. Carey) seconded the motion, and, there being no response to the Chairman's invitation to discuss the accounts, the resolution was put to the meeting and carried unanimously.

DIVIDENDS.

The CHAIRMAN thereafter moved that dividends for the half-year ended December 31, 1933, be paid at the following rates (all less income-tax):

5 % per annum on the 5% Preference Stock;
6 % per annum on the 6% Preference Stock; and
8½% per annum on the Consolidated Ordinary Stock,

payable on Tuesday, March 6, 1934.

Mr. S. HUNTER JONES, M.Inst.C.E., seconded the resolution, which was carried unanimously.

RE-ELECTION OF DIRECTOR AND AUDITOR.

The CHAIRMAN proposed the re-election of Mr. E. L. Burton, F.S.A.A., being the Director retiring by rotation, remarking that he was an expert Accountant with a life-long knowledge of the Gas Industry.

The DEPUTY-CHAIRMAN seconded the proposition, which was carried unanimously.

The retiring Auditor, Mr. Hyde C. Burton, F.C.A., was also re-appointed.

VOTES OF THANKS.

The CHAIRMAN then moved a hearty vote of thanks to the officers, staff, and workmen of the Company for their services rendered during the year. The undertaking stood in a very favourable position when all the circumstances to which he had already referred were taken into consideration. The Directors would not have been able to present anything like such satisfactory accounts unless they had received the loyal and devoted services of the staff and workmen. Many people, perhaps, regarded this vote of thanks as a mere formality, but actually it was something very different to his mind. They appreciated the exceptional value of the services of their Engineer and Manager, Mr. D. C. Cross, their Secretary, the staff, and the efforts of the workmen and all those connected with the practical side of the Company. They had helped the Board very considerably to surmount the difficulties of a very trying period.

The DEPUTY-CHAIRMAN seconded the vote of thanks, remarking that he most heartily endorsed all that the Chairman had said, and the resolution was carried unanimously.

Mr. D. C. CROSS, in acknowledgment, said they very much

appreciated this vote and thanked the Board for it. He would take the opportunity of conveying it to all those at the works. The year 1933 had been an extraordinary one inasmuch as they had lost five members of the staff either by retirement or death, with an average of 35 years' service, who had been with Mr. Cross ever since he joined the Company. This was a great loss to the Company, but those who had taken their places had given every satisfaction.

Mr. N. H. DAVIES also responded on behalf of the secretarial staff, remarking that he felt it a great honour to be associated with such a fine Board of Directors—a sentiment shared by all the staff and workmen.

On the proposition of Mr. D. C. ROBERTS, seconded by Mr. A. E. HOBBS, a hearty vote of thanks was accorded to the Chairman and Directors for their management of the affairs of the Company, which the CHAIRMAN briefly acknowledged.

Hornsey Gas Company

LOW PRICE OF GAS MAINTAINED

The Annual Ordinary General Meeting of the proprietors of the Hornsey Gas Company was held at 5, Great Winchester Street, London, E.C., on Friday, March 2, 1934—Mr. A. M. PADDON, M.Inst.C.E. (Chairman of the Company), presiding.

The GENERAL MANAGER AND SECRETARY (Mr. K. Leslie Mortimore, A.C.A.) read the notice convening the meeting, and the Directors' report and statement of accounts for the year ended Dec. 31, 1933, were taken as read.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, presenting the report and accounts, and noting that among the shareholders present there were a good many who were closely conversant with gas affairs, said that if they were going to institute comparisons between the Company's statement and those of other undertakings—as he was sure they would, because that was the only intelligent treatment of them—he would beg them to remember the very limited scope of the Hornsey Company for economy and development and the disabilities under which it laboured. The first of these disabilities was that the area of supply was surrounded entirely by fully developed gas undertakings, and there was no topographical extension to which it could look forward. Then there was the fact—which he must call a disability from the financial point of view—that it sold the cheapest gas for any whole or undivided area in the Metropolis. These things together made the conduct and the development of the Undertaking more difficult than in ordinary cases where there was a natural expansion of area and where there was a margin upon the revenues allowing of the reduction of capital and those general economies to which undertakings looked to improve their position.

The decrease of 2·4% in the sales of gas for 1933 as compared with 1932 was to some extent explained by the facts he had mentioned. But, to compare that result with those of undertakings which did not labour under such disadvantages, it was very creditable, for decreases of output had been characteristic almost throughout the Gas Industry. Only here and there, in exceptional circumstances, could an increase be brought to notice.

The capital account showed that during the year the Company had spent the very limited amount of just over £2,000 for capital purposes, and a little more than three-quarters of that amount was spent on new meters. That in itself was a healthy sign; it showed that the Company was still able to promote the sale of gas among fresh consumers, and that it was maintaining the efficiency of its meters. If this particular element were allowed to fall into arrears it became one of the most destructive in the domestic outfit. The efficiency of the meters and appliances in the Company's district corresponded to the efficiency of the works, which, as the accounts showed, must necessarily be of a very high standard.

The credit side of the capital account showed that the Company had overspent to the extent of £43,000; except so far as that was represented by loan, the Company had not to pay for it, for it was provided out of the operations of the Undertaking. The total capital figure represented about £473 per million c.ft.; but if one deducted the balance of capital account and added the loan, the figure was reduced to £434 per million c.ft. That was one of the features which had enabled the Undertaking to sell gas at a low price and to maintain its relative position in regard to other gas undertakings. Of course, in the past the capital expenditure had been very much lower, but it must be realized that for a common purpose it was necessary to expend much more capital nowadays than was expended twenty years ago.

GAIN ON RESIDUALS.

Coming to the revenue account, he said that by reason of the decrease in the sale of gas the income from that source, and for rentals of meters, stoves, and fittings was a little more than £4,000 less than in the previous year. But the Company had gained a little on residual products, and there was an increase in the figure for rents and transfer fees. The net result was that the total on the credit side of the account was less by £3,579 than in the previous year.

The sale of gas was 779 millions, and the unaccounted-for gas was down to the extremely low figure of 1½%—another indication of executive efficiency.

Although the Company was circumscribed and limited in certain ways, as he had indicated, the number of consumers had increased during the year by 278—which was not bad—and the number of appliances sold had increased during the year by nearly 40%. That was characteristic of most undertakings during the last few years; it was attributable very largely to the special activities of the staff in pushing the sale of appliances, but perhaps in a greater degree to the popularity of the hire-purchase system. The Chairman considered that, as a basic principle, hire purchase was altogether bad, but as a commercial practice it found universal acceptance, and it was the duty of the Company to meet the demand. It relieved the Company's capital, as compared with providing apparatus for simple hire, and if the public liked the hire-purchase method of acquiring apparatus it was not for the Company to say them nay. But it was essential that the gas companies should keep under definite supervision the apparatus so acquired, although nominally it was the property of the consumer; the system should not exempt gas undertakings from following up and taking due care of the apparatus thus purchased, because if they failed to do so the system would be a disability in the long run. The Hornsey Company was taking all the necessary steps in that direction.

Discussing the debit side of the revenue account, the Chairman said that coals and oil had cost nearly £1,000 less than in the previous year, repairs to works and plant had cost £2,380 less (without impairing the efficiency of the plant), and the expenditure on mains was £1,222 less. The total maintenance charges amounted to nearly 1s. per 1,000 c.ft.—and that should reassure anybody who was aware of the general condition of the Company's works and district.

The charge for the superannuation and pensions fund was £3,843; that was necessary as a regular contribution, to maintain the fund in healthy order. The amount carried to renewal fund was £3,576.

The net result had been to reduce the expenditure by £4,889, and the profit was increased by £1,310.

READJUSTMENT OF FINANCE.

In the profit and loss account a radical change had been made in the readjustment of the Company's finance. It did not really affect the assets of the Company, but it had been necessary. A sum of £10,000 had been transferred to the co-partners' contributory pensions fund from the carry forward. This fulfilled a cardinal requirement imposed by the actuary, that the Company should make the fund stable as soon as possible; but it also helped in another way, because the carry forward, which amounted to £24,825, was considerably in excess of the amount the Company, by its Acts, was allowed to carry forward, so that it was incumbent upon the Company to reduce the carry forward. In transferring the sum referred to, the Company had reduced the carry forward to an amount complying with statutory requirements without making any material disturbance of their financial condition. It was reduced from £24,825 (in 1932) to £20,641 (in 1933), which was a very ample carry forward and was just within the statutory limit.

Nothing had been added to the reserve fund, for the simple reason that the Company could not do so; there was no margin on the dividend. Anyone who was inclined to be hypercritical might say that the small amount in the reserve fund was the blemish on the Company's accounts. But the Chairman pointed out that it was only with the greatest difficulty that the Company could start it at all in the old days. Those concerned at that time had had the rather depraved idea that the proper place for the reserve fund was in the liquid assets of the Company. But that was all wrong, in law, in equity, and in everything else. However, the fund was started very late, whereas other companies had started such funds very early, and it was not so large as one would like to see it; but it had the merit that, such as it was—it amounted to over £10,000—it was invested outside the Company, and there was nothing to cause disquietude.

Of the £25,000 in the special purposes fund, over £11,000 was invested, and that was a good proportion. The sum of £3,576 had been transferred from the revenue account to the renewal fund; that was in the form of a floating balance in order to regularize and adjust inequalities in the yearly demands for repairs and maintenance.

Discussing the balance-sheet, the Chairman pointed out that the Company's investments had a book value of £21,182 and an actual value of practically £30,000; so that there was something like a 50% appreciation there. It was also shown by the balance-sheet that the Company had overspent capital account by £43,000; and if it could keep going without raising capital, that fact was a tribute to the elasticity of its finance. The loan from bankers, shown in the balance-sheet, had been taken into account when he had stated that the capital raised amounted to £434 per million.

TRUTH IN ADVERTISING.

The Company's weapons to deal with the difficulties confronting it were a very efficient apparatus, a very skilled and eager staff, and a growing popularity of the use of gas for purposes

to which it had not been applied hitherto. Those purposes must be brought to the attention of the consumers, and all necessary steps were being taken to that end. The electrical competitors were very active; they told the public not only of the uses to which electricity could be put, but also of innumerable other uses to which it could not be put, and they managed to sell apparatus on that basis. The Gas Industry did not wish to emulate that, because if it threw its bread on the waters in that way it was apt to come back in the form of rocks instead of increment. It was of no use selling a customer something which he could not use or telling him something he could not turn to practical experience. He could not say the same for the electrical industry as for the Gas Industry; but that was all to the good of the latter.

There was not the slightest doubt that the conduct of a gas undertaking to-day was rapidly assuming a different complexion from that of former days. The old-fashioned people had said that the money was made in the retort house; but if gas undertakers to-day did not come out of the retort house they would lose what they had got, because the money had to be looked for on the district, by popularizing gas and developing in the consumers a true sense of the economies and advantages connected with its use.

The Chairman formally proposed the adoption of the report and accounts.

Mr. G. W. Carey (Deputy-Chairman) seconded.

The report and accounts were unanimously adopted.

Dividends.

The following resolution, moved by the Chairman and seconded by Mr. Frank H. Jones, M.Inst.C.E., was carried unanimously:

> "That there now be declared dividends for the half-year ended Dec. 31, 1933 (being the final dividends for the year), as follows: On the 5% preference stock, £5% per annum; on the 5% stock, £7 10s.% per annum; and on the 3½% stock, £6% per annum; all less income-tax (making, with the interim dividends already paid on the 5% stock and 3½% stock respectively £7 10s.% and £6% for the year); and that such final dividends be paid on Saturday, March 3, instant."

Re-Elections.

Mr. Frank H. Jones, proposing the re-election of the retiring Directors—Mr. A. M. Paddon and Mr. G. W. Carey—said that all wise people who knew they had good things did not go out of their way to lose good things. Although the renewal and general purposes funds of the Company were invested in A1 trustee securities, the Company's best investment was Arthur Matthews Paddon; he worked extremely well in tandem or in double harness with Mr. Carey, both in the Hornsey Company and in other Companies with which they were connected.

Mr. J. W. Buckley, M.Inst.C.E., as one who had been connected with Mr. Paddon and Mr. Carey for a very long time, both as an official of the Company and as a Director, heartily seconded the motion.

Both Mr. Paddon and Mr. Carey were re-elected, and briefly returned thanks.

On the motion of Mr. K. R. MacKay, seconded by Mr. A. H. Godwin, Mr. H. A. Floate was re-elected an Auditor of the Company.

In a brief response, Mr. Floate paid a tribute to Mr. Mortimore (General Manager and Secretary) and his staff on the manner in which the books were kept.

Votes of Thanks.

The Chairman, proposing a vote of thanks to the General Manager and Secretary, the Engineer, and the other officers and staff for their services to the Company, commented upon the exceptional demands made upon the staff by reason of the very special circumstances he had mentioned earlier; their efforts were well reflected in the accounts, but, quite apart from that, the Directors appreciated the value of the officers' services and the fact that they could count upon them in the future. Although Mr. Mortimore and Mr. Gandon (Engineer and District Superintendent) had been appointed fairly recently, it was not merely a case of new brooms sweeping clean, but of brooms which were continually sweeping very clean. He asked that they would convey this expression of thanks to the staffs and to all the co-partners at the works for their excellent services. The best prospect the Company had was that it would be served during the next year by those who had served it during the past year.

Mr. Buckley seconded, and the resolution was carried.

Mr. Mortimore, responding, emphasized the extreme loyalty of the staff, and commented upon their excellent work during the past year. They would, he said, appreciate very highly the remarks that had been made.

Mr. Kenneth R. Gandon (Engineer and District Superintendent) assured the meeting that the expressions of appreciation were a source of great encouragement to all concerned.

Mr. A. W. Oke, proposing a vote of thanks to the Chairman and his co-Directors for their management of the Company's affairs during the past year, said that the figures presented were astonishing, and he felt that the Hornsey Company must be the envy of a good many others. He commented particularly on the fact that the unaccounted-for gas amounted to only 1½%. Referring to the bank overdraft, he suggested that consumers and shareholders might be glad to compete with the bank in the matter of the terms on which they would lend money to the Company if it were required. There was something in the view formerly held, that funds should not be fully invested; for example, Consols might be bought at about £112 and perhaps sold at £46 or £47 because money was required, whereas if the money were only partially invested there would not be the same loss. The late Sir George Livesey had said that it was sufficient to invest only half the reserve fund; there was a certain amount of wisdom in that. He recalled the difficulty of acquiring shares in the Hornsey Company some years ago, when one had to wait perhaps three years because the shares were held so tightly. If the Company was working on the sliding-scale principle, perhaps the shareholders might look for an increase of dividend in the future.

Mr. E. A. Pierce seconded the vote of thanks.

Mr. Godwin (a Co-partner), who supported, commented that the co-partners were beginning to realize that possession brought responsibilities, and they were supporters of both capital and labour.

The vote of thanks was carried.

The Chairman, after expressing appreciation, said the Directors were only too willing that the proprietors of the Company should compete with the bank in lending money, if the proprietors would accept a little less rate than the bank; but he did not see them doing it. With regard to the investment of the Company's funds, he felt that in respect of the reserve fund and many other collateral funds the Directors were to a certain extent trustees, and that the value of those funds was exactly *pro rata* to the commercial risk in which the Company was involved. He daresay that risk was very small, but he felt that the guide in these matters ought to be principle and not cupidity.

The meeting then closed.

Brighton, Hove, and Worthing Gas Company

Littlehampton Amalgamation.

Resolutions were passed at the meeting of the proprietors of the Brighton, Hove, and Worthing Gas Company on March 2 approving a further addition to the Company's area of supply by the acquisition of the Littlehampton Gas Company.

The Chairman (Mr. A. M. Paddon, M.Inst.C.E.), in moving the adoption of the report and accounts, said they had spent £110,844 on capital account during the year, but that amount was reduced by some £19,000 by depreciation. If they reckoned the capital without taking into account the amounts added on conversion it came out at the not unsatisfactory figure of £563 per million c.ft. sold, placing them very much where they were 20 years ago. They had to remember, however, that in these days a disproportionate amount of capital had to be expended for a common result as contrasted with 20 years ago. On the credit side of the revenue account it would be seen they had lost some £23,080 upon the sale of gas by reason of the reduced amount sold, which, as the report said, was equal to 2·43%.

On total rental, including gas, meters, stoves, and fittings, they were down by £24,494, and residuals had brought in £7,148 less. That might be a little disturbing if they took those figures by themselves, but if they associated them with the activity of the Company in other directions it would be seen they were not indicative of the vitality of the business, because during the year they had acquired nearly 3,000 new consumers. They had also a net gain in sale or hire of 3,142 cookers, over 1,500 fires, 340 boilers, 427 geysers, and so on. In every particular there was an increase in the output of apparatus.

When they came to the other side of the account he could give a more cheerful series of statistics. They had saved £20,606 on coal and oil, notwithstanding that they had to provide a very heavy sum for duty upon oil in stock. Nevertheless, the economies effected in the works had considerably outweighed this abnormal item of oil duty. Their wages were less, while the repair and maintenance of works was more by £10,500, but that included the last portion of the Worthing works to be written off to the extent of £12,500, so that comparatively early in their mutual history that charge for the displacement of the Worthing works disappeared.

It would be seen in the profit and loss account that they carried forward to next year £48,918, which was just £37 more than in the previous year. The reserve fund received the benefit of a transfer from profit and loss account and now stood at the very handsome figure of £137,160. It was invested, almost entirely, outside the Company. The investments of the Company, standing in the accounts at £181,000, had an actual value of £238,000.

Dividends were declared for the half-year as follows: £3% on the "B" preference consolidated stock; £3% on the "D" redeemable preference stock; £3 15s.% on the 6% standard consolidated stock; and £3 7s. 6d.% on the 5% standard consolidated stock.

Gas Companies' Results in 1933

Barnet.

The Directors of the Barnet District Gas and Water Company submit a report which states that the quantity of gas sold has increased by 1·63%. On Nov. 30 last, £50,000 4½% preference stock was offered by the Directors for sale by tender, the stock realizing with premiums the sum of £57,315. After placing to renewals (gas and water) funds the authorized contributions, the payment of debenture and other interest and an interim dividend on the ordinary stock at the authorized rate of 7% per annum, and the placing of £5,000 to general reserve, there remains a balance of available profit of £55,867. The Directors recommend the declaration of a dividend, less income-tax, for the half-year ended Dec. 31 last, on the ordinary stock at the rate of 7% per annum, and at 4½% per annum, less income-tax, on the preference stock for 31 days ended Dec. 31 last, leaving to be carried forward a sum of £36,158.

Barnstaple.

Another very satisfactory increase in trade is reported by the Barnstaple Gas Company. The balance standing to the credit of the profit and loss (net revenue) account amounts to £6,549, out of which the Directors recommended the declaration of a dividend, less income-tax, for the year at the rate of £13% per annum on the "A" shares, and £9 2s.% per annum on the "B" shares. The Directors announce a reduction of two-fifths of a penny per therm (equivalent to 2d. per 1,000 c.ft.) to take effect as from the readings of the meters at the December quarter. The increase in the sales of gas has been 1,768,200 c.ft., and in the number of consumers 130. The revenue account shows that the income for gas was £18,080, compared with £17,746 in 1932, a gain of £334; rental from meters, stoves, and fittings increased from £2,743 to £2,842, and the revenue from residuals was £4,439, as against £4,333, the total revenue for the year being £25,690, against £24,978 for 1932. The total expenditure amounted to £21,896, as compared with £21,260 in 1932. In the year under review the Company carbonized 6,839 tons of coal, and made 95,447,500 c.ft. of gas, 3,933 tons of coke, 69,642 gallons of tar, and 33¼ tons of sulphate of ammonia.

Blyth.

The revenue of the Blyth Gas Company amounts to £42,481 and the expenditure to £33,255, leaving a profit on the year's working of £9,225. The Directors recommend that a dividend of 4% less income-tax on the ordinary stock be paid, making with the interim dividend paid in August last £8% for the year, 1933, and that the balance of £9,505 be carried forward to the next account.

Bromsgrove.

The profit and loss account of the Bromsgrove Gaslight and Coke Company, including the balance of £2,802 brought forward from last year, shows after paying interest on debenture bonds, bank interest, and income-tax, transferring £175 to reserve contingent account, and providing for the interim dividends paid on Sept. 1 last, a balance of £3,972. The Directors recommended that this balance be disposed of as follows: To pay a dividend on the original shares of 10% for the year, amounting to £1,200, and to pay a dividend on the "B" shares of 7% for the year, amounting to £2,457, less income-tax. A balance is carried forward to next year's accounts of £2,601.

Cork.

The report of the Cork Gas Consumers' Company for half-year ended Dec. 31, 1933, when compared with the corresponding period 1932, shows a slight falling off in sales of gas and residuals which was almost entirely due to the extremely fine weather that prevailed during the greater part of the period. After placing £1,129 to credit of depreciation fund, the balance of profit and loss is £4,386, out of which it is proposed to pay the usual dividend at the rate of 8% per annum.

Dover (S.E. Gas Corporation).

The accounts of the Dover Gas Company for the year show that after paying in respect of the June half-year a dividend of £3 15s.% on the ordinary stock and shares, and after providing for all fixed charges, including depreciation of stoves on hire and contributions to general purposes renewals and co-partnership funds, there is a total available balance of £17,757, out of which the Directors recommend the payment of the following dividend in respect of the December half-year—viz.: On the ordinary stock and shares at the rate of £4 15s.%, less income-tax (making, with the interim dividend, 8½% for the year), which will absorb the sum of £5,818, leaving £11,938 to be carried forward to the credit of the current year. The sales of gas show an increase of 105,456 therms, equal to 6·88%, over the year; the number of consumers has increased by 217, while the number of gas cookers and appliances sold has been satisfactorily maintained. Since the last annual meeting of the proprietors, states the report, Mr. W. R. Mowll, Mr. H. Crundall, and Mr. E. Bradley have resigned their office as Directors. Sir David Milne-Watson was elected in place of Mr. H. Crundall; Mr. Henry Woodall was elected in place of Mr. W. R. Mowll; and Major Julian Day in place of Mr. E. Bradley.

Eastbourne.

The sale of gas for the year 1933 by the Eastbourne Gas Company was 2,899,191 therms, and represents a decrease of 3·14% compared with the year 1932. This decrease occurred mainly in the first six months of the year, and the Directors therefore considered it advisable to reduce the interim dividends on the "A" and "B" stocks paid in September last. The balance at the credit of the profit and loss account available for final dividends, after payment of the interim dividends in respect of the half-year ended June 30, 1933, and providing for interest charges, &c., is £10,102. The Directors recommended the declaration of dividends for the half-year ended Dec. 31, 1933, being final dividends for the year, at the following rates (all less income-tax), viz.: On the "A" stock at the rate of £8 10s.% per annum; on the "B" stock at the rate of £7% per annum; and on the 5% preference stock at the rate of £5% per annum, making a total distribution for the year of £8% per annum on the "A" stock, £6 10s.% per annum on the "B" stock, and £5% per annum on the 5% preference stock. The final dividends will absorb the sum of £9,771, leaving a balance of £331 to be carried forward.

Exeter.

The past year was notable for the large amount of sunshine, and the average customer did not find it necessary to use gas as much as normally. When, however, the cold spell of weather came in December, the daily output of the Exeter Gaslight and Coke Company created a record in the history of the Company. The large increase in the business of the Company during the past twenty years, which has nearly doubled, has necessitated extensive alterations in the Southernhay offices and showrooms. The Directors have placed a contract for these, and the work is now in progress. When it is finished, both the public and the staff will have improved accommodation for the transaction of the growing business of the Company. A dividend for the half-year ended June 30, 1933, was paid in August last, and the Directors now recommend the payment at the same rate for the six months ended Dec. 31, 1933, viz.: 10½% per annum on the £40,000 original stock, and 7½% per annum on the £130,500 new ordinary shares, both less income-tax.

Fleetwood.

The half-yearly report of Fleetwood Gas Company shows capital account of £1,331 15s., and a profit on the half-year's working of £2,175, reduced by debenture and loan interest to £1,418. A dividend at the rate of 6% is recommended by the Directors to be paid on the preference stock, 6% on ordinary stock, leaving £60 to carry forward.

Gloucester.

The Directors of the Gloucester Gas Light Company recommend to the proprietors a dividend at the rate of 5% per annum on the consolidated ordinary stock, *less* income-tax, for the year ended Dec. 31, 1933, of which an interim dividend for the half-year ended June 30, 1933, was paid in August last. The Directors, having deemed it advisable to avail themselves of the opportunity of raising loan capital on the most economic conditions, are pleased to report that during the latter half-year they offered to the public £40,000 of 4% perpetual debenture stock which realized £40,447 at an average price of £101 2s. 4d.%. This diminishes the amount of mortgages on which the Company are paying from 5 to 5½%, and will save all renewals in future. It is hoped to obtain all loan capital on the same basis.

Grantham.

A disposable balance of £6,933 is shown by the Grantham Gas Company, and the Directors recommend payment of a dividend of 3%, less income-tax, making the total dividend for the year 5%. The Directors, it is announced, have decided to reduce the price of gas to 1s. per therm as from the beginning of the present year. The Company's business continues to expand; the consumers number 6,164, an increase of 128 since the last meeting. The actual sales of gas show an increase of over three million c.ft., or 2½%. A new Tully gasification plant has been an important addition to the works, it having replaced the obsolete producer plant. At an extraordinary general meeting of the Company it was decided that £48,000 debenture stock be issued, on such terms and at such times and in such amounts as the Directors might consider desirable, for the discharge of the present £40,000 mortgage of the Company and for general purposes.

Harrogate.

The profit on revenue account of the Harrogate Gas Company is £33,628. The net revenue account after payment of interest on debenture and dividend on the preference stocks, co-partnership bonus for the year 1932, and an interim dividend on the new consolidated stock, shows an available balance of £32,935. The Directors recommend the payment of 3% on the new consolidated stock (making the maximum 6% for the year), and co-partnership bonus for 1933 amounting to £1,934, leaving balance forward to the net revenue account of £22,887.

Hastings.

The accounts of the Hastings and St. Leonards Gas Company show a total expenditure of £124,734, and a total income of £153,281, leaving a balance of £28,546, to which has to be added £242 received for interest. The sum required to meet the interim dividends which were paid last September, the dividends now recommended, interest on debenture stock and consumers' deposits, and income-tax is £28,540. The Company's mains have now been extended to Icklesham and Winchelsea. In a year of remarkably fine weather, the demand for gas was adversely affected, and this is also influenced by the installation of so many efficient and economical gas-using appliances. The gas sold in the year showed a decrease of 0·71% only as compared with the record year of 1932. In December, when there was a cold snap, evidence of the demand for both gas and coke was pronounced. Interim dividends (less income-tax) were paid as follows: £7% per annum on the 5% converted stock, £5 10s.% per annum on the 3½% converted stock, and £6 8s.% per annum on the 5% additional stock. The Directors recommend that the final dividends for the year be paid at the same rates.

Isle of Thanet.

The total quantity of gas sold by the Isle of Thanet Gas Light and Coke Company during the year was 473,360,500 c.ft., representing an increase of 5,521,000 c.ft., or 1·18% over the previous year. The price of gas was reduced from 8d. to 7½d. per therm, or 3s. 0·8d. to 2s. 10·5d. per 1,000 c.ft. from the end of the March quarter last. Another attractive showroom with lecture hall has been provided at the Dane Schools, Dane Road, while premises will be opened shortly in Canterbury Road to meet the needs of the Westbrook District. An interim dividend of 4½% was paid in September last, and the Directors now recommend a final dividend at the same rate.

Keswick.

After allowing for depreciation of cookers and meters, the revenue account of the Keswick Gas Company shows a balance to credit of £1,957 on the year's working. Deducting from this amount £74 for interest on loans, £765 for income-tax, and adding £184 interest on investments, there remains a sum of £1,302. The Directors propose a dividend at the rate of 10% per annum upon the original capital of the Company, and at the rate of 7% per annum on the additional capital of the Company (both less income-tax), and to carry £287 to the contingent fund. This will absorb £1,086, leaving £215 to be added to profit and loss account. There has been a considerable increase in the output of gas—some 1¾ million c.ft.—and for the first time the make for the year has exceeded 40 million c.ft. The price of gas was further reduced from July, following a reduction the previous year, and is now 5d. per 1,000 c.ft. less than two years ago.

Leighton Buzzard.

The revenue account of the Leighton Buzzard Gas Company shows a balance of £4,115, and the balance standing to the credit of the profit and loss account is £3,271. The Directors recommended a dividend at the rate of 6% per annum on the consolidated ordinary stock, amounting to £3,111, from which income-tax amounting to £277 has to be deducted. There is a small increase of £208 in the profit on the year, and the Directors proposed to carry forward £259 to the reserve fund and £250 to the renewal fund.

Liverpool.

The Directors present a statement of the Liverpool Gas Company's accounts for the year ended Dec. 31 last, which show that the total revenue during that period was £1,382,223, and the expenditure £1,184,680, leaving a surplus of £197,543, which has been transferred to the credit of net revenue account. After deducting the amount taken for payment of the dividend on the ordinary stock declared last August and on the preference stock for the year, together with the interest on the debenture stocks and mortgages, there remains a balance out of which the Directors recommend to the proprietors under the authority and in accordance with the provisions of the Liverpool Gas (Charges) Order, 1921, that a dividend for the half-year ended Dec. 31 last be declared of £3% on the ordinary stock of the Company.

Newcastle.

The revenue account of the Newcastle-upon-Tyne and Gateshead Gas Company does not show much variation in total from the previous year, and with one or two exceptions the details are very similar. About £14,000 less has been received for gas owing chiefly to the last reduction in price operating for the whole year instead of only for a portion of it as in 1932. On the other hand, residuals have provided about £13,000 more due to special circumstances in regard to tar not likely to recur. On the expenditure side the cost of coal, oil, and gas bought shows a reduction, as do also the cost of repairs and other expenses at works. Against this, however, considerably more has been spent on the renewal of cookers on account of supplying to

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prepayment consumers more economical appliances. The result of the year's working is that after providing the usual contributions to the special purposes and renewal funds and the ordinary depreciation, the Company are in a position to pay a dividend on the preference stock at the authorized rate and to recommend the payment of a final dividend of £2 17s. 6d.% on the ordinary stock, which, with the interim dividend paid in August last, makes £5 7s. 6d.% for the year—the same rate as that paid during the last few years—and to increase the amount carried forward by £1,895.

Newmarket.

The balance brought forward by the Newmarket Gas Company from last year is £8,741; less debenture interest paid for the year 1933, £162; leaving £8,579. The profit earned during the year 1933 is £5,010; making a balance at the credit of profit and loss account of £13,589. The Directors recommend that out of this amount a dividend be paid at the rate of 8¾% for the year 1933 upon the £65,000 original consolidated stock of the Company, less income-tax, leaving to be carried to next year's account £9,323.

North Middlesex.

The sale of gas by the North Middlesex Gas Company for the year shows a decrease of 0·03%. The accounts reflect less than a complete twelve months' trading owing to a change made in the date of reading consumers' meters, and a consequent adjustment of the date of closing the Company's books. The profit for the year (including interest received), after charging interest on debenture stock and temporary loans, income-tax, &c., and transferring the sum of £2,600 to the contributory pensions fund, amounts to £24,134, which, with £7,344 brought from the previous year, makes the disposable balance £31,479. Interim dividends on account of the year ended Dec. 31, 1933, declared by the Directors, were paid in September last at the following rates: On the 5% preference stock, 5% per annum; on the 6% preference stock, 6% per annum; on the standard consolidated stock, 7½% per annum (less income-tax), and the Directors recommend the declaration of final dividends for the year at the same rates (less income-tax), and that £2,000 be transferred to the reserve fund. These appropriations (including the interim dividend) amount to £23,920, leaving £7,558 to be carried to the credit of the profit and loss account for the current year. During the year £15,640 4% perpetual debenture stock was issued, realizing £15,727, part of the proceeds being utilized to repay £11,250 5% redeemable debenture stock.

Oakham.

A profit of £1,818 on the past year's working is disclosed by the Oakham Gas and Electricity Company's annual report, £1,722 being accounted for by gas and £96 by electricity. After paying £450 for debenture interest, the net balance is £1,368. A sum of £175 has been written off the new account, and the Directors propose to pay a dividend of 5% for the year on the original stock and shares, 3½% on the additional ordinary shares (7% standard), and 4% per annum for three months on the new ordinary shares (8% standard), leaving £287 to be carried forward to the next account, as against £515 brought in.

St. Austell.

The St. Austell Gas Company record a substantial increase in the revenue from the sale of gas, which represents the sale of an additional 1,000,000 c.ft. The balance standing to the credit of profit and loss account, amounting to £2,355, the Directors recommend should be appropriated as follows: Dividend at the rate of 8½% per annum on old shares and 7% per annum on new shares, less income-tax; carry to reserve fund £200, to special purposes fund £150, to renewals fund £150, and to pensions fund £100, leaving to be carried forward to next account £932.

Sheffield.

The total quantity of gas sold by the Sheffield Gas Company during the past year was 5,323,980,000 c.ft., being an increase of 350,513,000 c.ft., or 7·04% on the previous year. The price of gas throughout the year has remained at 6⅜d. per therm, or 2s. 9d. per 1,000 c.ft. for small quantities, with proportionate reductions to large consumers, the lowest prices being 2⅛d. per therm, or 1s. per 1,000 c.ft., and 2d. per therm, or 10d. per 1,000 c.ft., for special large quantities. An interim dividend at the rate of 6% per annum was paid for the half-year ended June 30, 1933, and it is now proposed to pay a final dividend to Dec. 31, 1933, at the same rate, making a total distribution for the year of 6%. After the payment of these dividends there remains a balance of £63,563 to be carried forward to next year.

Southgate.

The sale of gas by the Southgate and District Gas Company shows an increase of 2·64% compared with that for the preceding year. The accounts reflect slightly less than a complete twelve months' trading owing to a change made in the date of reading consumers' meters and a consequent adjustment of the

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date of closing the Company's books. The installation of gas appliances continues to be satisfactory. After providing for interest, income-tax, &c., and transferring £2,000 to the contributory pensions fund and £1,000 to the reserve fund, the balance of profit available for distribution is £20,463, from which interim dividends of £5,410 on account of the half-year were paid on Sept. 1, 1933, at the following rates: On the preference stock, £5% per annum; and on the consolidated (7% maximum) stock, £7% per annum (both less income-tax), and the Directors now recommend the declaration of final dividends at the same rates. This distribution (including the interim dividends) will amount to £10,820, leaving £9,643 to the credit of the profit and loss account to be carried forward to the current year. An issue of £25,000 4% debenture stock was made during the year at 101%, the proceeds being credited to capital account.

South Shields.

The revenue of the South Shields Gas Company amounts to £124,022, and the expenditure to £103,748, leaving a profit of £20,273, making, with bank interest and the balance from previous year, £34,535. It is proposed to apportion this sum as follows: In paying the year's dividend on consolidated stock at 8½% per annum, less income-tax, the year's dividend on ordinary stock at 5⅜% per annum, less income-tax and the year's interest on mortgages, &c., which will leave a balance to carry forward of £14,154. Owing to the continued trade depression in the Company's area there has been a slight decrease of 1·04% in the quantity of gas sold. The income from residual products shows a net increase of £2,147, as compared with the previous year.

South Staffordshire Mond.

The amount of fuel gasified during the year by the South Staffordshire Mond Gas Company is 9% more than last year, while the cost of fuel gasified is 5% more than for 1932. The gas distributed during the year is 11% more than during 1932. The gross profit for the year is £20,921; deducting prior lien and debenture stock interest amounting to £12,916 there remains a net profit for the year of £8,004. An amount of £21,900 has been brought forward from the previous year, which makes the amount of undivided profit standing to the credit of the profit and loss account at Dec. 31, 1933, £29,904. The Directors recommend that a dividend of 6% for the year 1931 be paid, less tax, to holders of cumulative preference shares. After paying this preference dividend. the amount standing to the credit of profit and loss account is £24,954.

Swansea.

The Directors of the Swansea Gas Light Company recommend the declaration of a dividend of 5½% per annum on the redeemable preference stock of the Company, of which an interim dividend at the rate of 5% per annum for the half-year has already been paid. They also recommend the declaration of a dividend of 5% per annum on the ordinary stock of the Company, of which an interim dividend at the rate of 5% per annum for the half-year has already been paid. The scale of prices of gas was revised as from the December quarter, 1932, so as to give consumers more advantageous prices for large consumptions. The application to the Board of Trade for a Special Order under the Gas Undertakings Acts, 1920 and 1929, defining the borrowing powers of the Company and for other purposes, resulted in the Swansea Gas Order dated May 18, 1933. In consequence of this Order the statements of stock and loan capital in the Company's accounts have been revised.

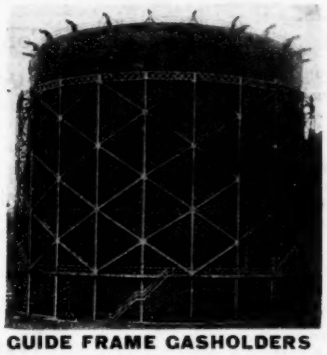
Tunbridge Wells (S.E. Gas Corporation).

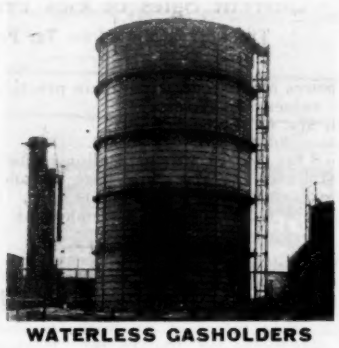
The audited statement of accounts of the Tunbridge Wells Gas Company for the year ended Dec. 31, 1933, shows that after paying in respect of the June half-year dividends at the rate of £7 4s.% per annum on the sliding-scale stock, and £5% per annum on the maximum stock, and after paying all fixed charges, there is a total available balance of £36,027, out of which the Directors recommend the payment of the following dividend in respect of the December half-year, viz., on the sliding-scale stock at the rate of £7 4s.% per annum, and on the maximum stock at the rate of £5% per annum, which will absorb the sum of £8,844, leaving £27,183 to be carried forward to the credit of the current year.

Wolverhampton.

The net profit of the Wolverhampton Gas Company, after payment of interest on the debenture stocks and contribution to the pensions fund, is £21,653. An interim dividend was paid at the following rates: 3% on the 6% preference stock; 2½% on the 5% preference stock; and 3½% on the consolidated ordinary stock; and the Directors recommend final dividends at the same rates—all less income-tax. They also recommend that the sum of £4,000 be placed to the reserve fund, the balance of £619 being carried forward. There has been a renewal of the increased demand for gas, particularly for industrial purposes, during the latter part of the year, while the number of consumers has increased, and there has been a satisfactory demand for all types of gas appliances.

SPIRAL GASHOLDERS


GUIDE FRAME GASHOLDERS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PURIFIERS

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Business on the Stock Exchange last week was very active. British Government securities, home railways, and leading industrials were the dominating features, and prices made substantial improvements. Consols were quoted at 80⅞ on Saturday, the highest price reached for over twenty years; 2½% Conversion Loan, 1944/49, finished at 94; while the 3½% War Loan established a record high level of 103⅞. Almost boom conditions prevailed in these sections right up to the close, and good buying was reported for the new Account which opens this week. Most of the other markets were subdued and comparatively neglected.

The activity in the gilt-edged section was also reflected in the Gas Market, and here again some substantial upward price changes were recorded. A large volume of business was transacted in the leading stocks, though, with the exception of a rise of 3d. in Gas Light units to 25s. 9d., the prices of these issues remained for the most part unchanged. Harrogate consolidated headed the list of increases with a gain of 7 points to 129½, the stock changing hands at 131, and at the time of writing this price includes the full final dividend of 3%. Both the Portsmouth stocks improved, the 5% maximum by 5 points to 107½. Mid Southern Utility consolidated came next with a gain of 4 to 115½, business being done at the top price of 118, and while dealing with this Company it is worth noting that the 4% preference stock now stands at 95½ only. At the local Exchange, Sheffield 4% debenture also rose 4 to 95, and it will be seen in the Stock and Share List that several other small increases in value were recorded.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *March 5.*

The prices of tar products remain practically unchanged, with current values as follows:

Pitch, 57s. 6d. per ton f.o.b.

Creosote, 3d. to 3¼d. per gallon.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, about 2s. 9d.; pure benzole, 1s. 10s. to 1s. 11d.; 95/160 solvent naphtha, about 1s. 9d.; and 90/140 pyridine bases, about 6s.—all per gallon naked at makers' works.

Tar Products in the Provinces.

March 5.

The average prices of gas-works products during the week were: Gas-works tar, 23s. to 28s. Pitch—East Coast, 57s. 6d. to 60s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 57s. 6d. to 60s.* Toluole, naked, North, 2s. 2d. to 2s. 4d. Coal-tar crude naphtha, in bulk, North, 6¼d. to 6¾d. Solvent naphtha, naked, North, 1s. 6d. to 1s. 7d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2¾d.; low gravity, 2d. to 2½d.; Scotland, 2½d. to 2¾d. Heavy oils, in bulk, North, 3¾d. to 4¼d. Carbolic acid, 60's, 2s. 1½d. to 2s. 2½d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *March 3.*

Prices continue fairly steady in this district, although the volume of business remains rather disappointing.

Crude gas-works tar.—The actual value is 35s. to 37s. per ton *ex* works.

Pitch.—The shipping season is now finished, and export value is purely nominal at 50s. per ton f.o.b. Glasgow. In the home market about 47s. 6d. per ton is obtainable for full wagon loads *ex* works in bulk

Refined tar is still quoted at round 3¼d. per gallon *ex* works in buyers' packages.

Creosote oil.—Production is well looked after, and prices of all grades are steady. B.E.S.A. specification is 4d. to 4¼d. per gallon; low gravity, 4d. to 4¼d. per gallon; and neutral oil, 4d. to 4¼d. per gallon—all in bulk *ex* works.

Cresylic acid.—There is very little new business being placed at present; but makers are in a comfortable position. Pale, 97/99%, is 1s. 1d. to 1s. 2d. per gallon; dark, 97/99%, 11d. to 1s. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha is commanding 4¾d. to 5¼d. per gallon, according to quality and quantity.

Solvent naphtha.—90/160 grade is slightly easier at 1s. 5d. to 1s. 5¼d. per gallon, while 90/190 grade is now quoted at from 9d. to 10d. per gallon.

Motor benzole, being on short production, still commands 1s. 7d. per gallon *ex* works in bulk.

Pyridines.—90/160 grade is 4s. 6d. to 4s. 9d. per gallon, and 90/140 grade is 5s. to 5s. 3d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole	0 10	to	0 10½	per gallon at works
Motor ,,	1 5	,,	1 5½	,, ,, ,,
90% ,,	1 5½	,,	1 6	,, ,, ,,
Pure ,,	1 8½	,,	1 9	,, ,, ,,

Trade Notes.

Benzole Recovery Plant.

We learn that the Chemical Engineering and Wilton's Patent Furnace Company, Ltd., have received instructions to build a benzole plant for the Maidstone Gas Company.

Contracts Advertised To-Day.

Coal.

Coalville Urban District Council. [p. 640.]

Leigh (Lancs.) Gas Committee. [p. 640.]

New Capital Issues.

Andover Lighting and Power Company.—The Directors of this Company are prepared to receive on or before noon on March 21 tenders for £15,000 5% irredeemable preference stock at a minimum price of issue of par. The stock may be tendered for in amounts of £5 or multiples thereof.

Register of Patents

A "Shut-Off" Burner.—No. 392,973.

BARRALET, J. H., and NEW GEYSERS (1931), LTD., both of Addington Square, S.E. 5.

No. 27,439; July 4, 1932.

The idea of this invention is to prevent the escape of gas from burners when, owing to a temporary failure of the supply, the gas at the burner has become extinguished while the control cock is left in its "on" position.

The invention relates more particularly to means for shutting off the burners from the source of gas supply in the event of the pressure in the gas supply pipe failing or falling below a predetermined value of the kind where a valve, adapted to be held in an open position by a stop adjusted to the retaining position by the pressure of the gas supply and to close automatically when the pressure of the gas falls below a predetermined level, is arranged to remain in the closed position until opened positively by hand or other means.

The patentees state that it has previously been proposed in such means to urge the valve to its closed position by means of a torsion spring wound by the turning of the valve to its open position.

According to this invention, however, the valve is automatically displaced to the closed position under the action of a magnet. Means are also provided for actuating the valve opening mechanism from the gas cock controlling the supply of gas to the burner.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Mar. 8. (Provincial Exchanges Mar. 2.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Oct. 9	7	7	Alliance & Dublin Ord. ...	130—135	+1	134
374,000	"	Jan. 8	4	4	Do. 4 p c. Deb. ...	99—100	...	...
567,655	"	Aug. 28	7	7	Barnet Ord. 7 p.c.	167—172	...	169½—169¾
300,000	1	Oct. 23	1/9‡	1/4‡	Bombay, Ltd.	26/6—28/6	...	...
178,480	Stk.	Feb. 19	9½	9½	Bournemouth sliding scale	195—205*	...	...
550,050	"	"	7	7	Do. 7 p.c. max. ...	161—166*	...	164—166
439,160	"	"	6	6	Do. 6 p.c. Pref. ...	139—143*	+3½	141½
50,000	"	Dec. 18	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
262,025	"	"	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
335,000	"	"	5	5	Do. 5 p.c. Deb. ...	120—125	...	124½
357,900	"	Aug. 28	7½	7½	Brighton, &c., 6 p.c. Con. ...	164—169	...	160
540,000	"	"	6¾	6¾	Do. 5 p.c. Con. ...	151—156	...	154¾—155
195,500	"	"	6	6	Do. 6 p.c. B. Pref.	136—141	...	...
1,487,500	"	July 24	5	5	Bristol 5 p.c. max.	117—118a	...	...
120,420	"	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	100—102a	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	100—102a	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	120—123a	...	...
865,000	"	Sept. 25	8	7	British Ord.	155—160	...	157—159½
100,000	"	Dec. 18	7	7	Do. 7 p.c. Pref.	153—158	...	...
350,000	"	"	5½	5½	Do. 5½ p.c. Pref.	106—111	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	100½
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
160,000	"	Jan. 8	5	5	Cambridge 5 p.c. Deb. ...	115—120	...	...
100,000	10	May 22	6	4	Cape Town, Ltd.	5½—6½	...	...
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¾	...	...
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb. ...	95—100	...	...
626,860	"	Feb. 19	6	6	Cardiff Con. Ord.	121—126*	...	...
237,860	"	Jan. 8	5	5	Do. 5 p.c. Red. Deb.	103—108	...	...
157,150	"	Feb. 19	5	6½	Chester 5 p.c. Ord.	119½ - 122½b*	...	...
98,936	1	Oct. 9	2/-	2/-	Colombo, Ltd. Ord.	1⅞—1⅞	...	...
24,500	1	"	1/4½	1/4½	Do. 7 p.c. Pref. ...	19/-—21/-	...	...
609,204	1	Oct. 9	/11 48	/11 48	Colonial Gas Assn. Ltd. Ord.	1⅛—1⅛	...	...
296,053	1	"	1/8‡30	1/8‡30	Do. 8 p.c. Pref.	28/-—25/-	...	...
1,775,005	Stk.	Feb. 19	5	6½	Commercial Ord.	120—125*	...	121—122
475,000	"	Dec. 18	3	3	Do. 3 p.c. Deb. ...	76—81	...	...
286,344	"	"	—	5	Do. 5 p.c. Deb. ...	121—126	...	...
807,560	"	Feb. 19	7	7	Croydon sliding scale ...	151—156*	...	154—155
569,590	"	"	5	5	Do. max. div.	103—108*	...	...
620,345	"	Jan. 8	5	5	Do. 5 p.c. Deb.... ...	120—125	...	...
542,270	"	Aug. 14	10	7	Derby Con.	177—182c	...	...
55,000	"	Jan. 8	4	4	Do. 4 p.c. Deb.	98—100c	...	...
209,000	"	Feb. 19	5	5	East Hull Ord. 5 p.c. ...	106—111*	...	...
179,500	"	Aug. 28	6	6	East Surrey Ord. 5 p.c. * ...	128—133	...	128
155,019	"	Dec. 18	5	5	Do. 5 p.c. Deb.	115—120	...	...
1,002,180	"	Sept 25	17	15	European, Ltd.	125—135	...	126—127½
19,342,763	"	Feb. 19	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	25/8—26/3d*	+⅛	25/—25/7½
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	86—89*	...	87—88½
4,477,106	"	"	4	4	Do. 4 p.c. Con. Pref. ...	102—105*	...	103—104
6,102,497	"	Dec. 18	3	3	Do. 3 p.c. Con. Deb. ...	82—85	...	83⅝—84⅜
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	114—117	...	116⅝—117
3,500,000	"	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	113—116	...	114½—115
270,466	"	Aug. 28	6	6	Harrogate New Cons. ...	127—132	+7	131
82,500	"	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	149—154	...	...
258,740	"	"	5½	5½	Do. 3½ p.c. Conv	117—122	...	119
140,000	1	Oct. 9	1/10	1/7½	Hongkong & China, Ltd. ...	29/-—32/-	...	...
213,200	Stk.	Aug. 14	6	6	Hornsey Con. 3½ p.c. ...	130—135	...	...
5,600,000	"	Nov. 6	14	10	Imperial Continental Cap.	202—212	...	206—209
223,130	"	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	89—94	...	...
235,242	"	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord. ...	172—177	...	...
2,167,419	"	Aug. 14	6	6	Liverpool 5 p.c. Ord. ...	132—134b	...	...
245,500	"	Dec. 18	5	5	Do 5 p c. Red. Pref. ...	101—111b	...	...
306,083	"	July 17	4	4	Do. 4 p.c. Deb. ...	01¼—103¼b	+1	...
165,786	"	Feb. 19	8	10	Maidstone 5 p.c. Cap. ...	180—190*	...	...
56,176	"	Jan. 8	3	3	Do. 3 p.c. Deb. ...	72—77	...	...
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean ...	9—11	...	10½
392,000	—	Oct. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb. ...	98—103	...	...
231,978	Stk.	Feb. 19	5	5	M. S. Utility "C" Cons. ...	113—118*	+4	118
818,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	93—98*	...	...
360,075	"	Jan. 8	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
148,955	"	"	5	15	Do. 5 p.c. Deb. ...	117—122	...	...
675,000	"	21 May '31	16	6	Montevideo, Ltd.	60—70	...	...
2,061,315	"	Aug. 14	8½	8	Newcastle & Gateshead Con.	26/-—26/6d	...	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	101—102d	...	...
776,706	"	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	90½—91¾d	...	...
277,285	"	Nov 6	5	5	Do. 5 p.c. Deb. '48 ...	1 b—107d	...	...
274,000	"	Feb. 19	5	5	Newport (Mon.) 5 p.c. max.	101—103a*	...	...
204,940	"	Aug. 28	7½	7½	North Middlesex 6 p.c. Con.	157—162	...	...
396,160	"	Feb. 5	5	5	Northampton 5 p.c. max. ...	99—104	...	...
300,000	"	Dec. 4	7	12	Oriental, Ltd.	147—152	...	150
316,617	"	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	165—170	...	...
504,416	"	Feb. 19	8	8	Portsm'th Con. Stk. 4 p.c. Std	168—173*	+1	170—172
241,446	"	"	5	5	Do. 5 p.c. max. ...	105—110*	+5	...
114,000	"	Feb. 19	5	5	Preston 5 p.c. Pref. ...	103—108*	...	...
686,312	"	Jan. 22	4	4	Primitiva 4 p.c. Rd. Db. 1911	87—92	...	...
389,813	"	Dec. 18	4	4	Do. 4 p.c. Cons. Deb.	88—93	...	...
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref. ...	6¾—7¾	...	...
1,736,968	Stk.	Sept. 11	6	6	Sheffield Cons.	135—137e	...	...
95,000	"	Jan. 8	4	4	Do. 4 p.c. Deb.	94—98e	+4	...
133,201	"	Feb. 19	8½	5	Shrewsbury 5 p.c. Ord. ...	135—140*	...	...
90,000	10	June 12	15	14	South African	3—5	...	...
6,709,895	Stk.	Feb. 19	5	7	South Met. Ord.	130—135*	...	129—133½
1,135,812	"	"	6	6	Do. 6 p.c. Irred. Pf.	138—143*	+2	139—141½
850,000	"	"	20/-g	4	Do. 4 p.c. Irred. Pf.	101—105*	+1	102½—103½
1,895,445	"	Jan. 8	3	3	Do. 3 p.c. Deb ...	82—85	+1	83¼—84½
1 000,000	"	Jan. 22	5	5	Do. 5 p.c. Red. Deb.	111—115	...	114½
209,820	"	Feb. 19	8½	8½	South Shields Con.	169—170d*	...	...
1,543,795	"	Feb. 19	6	6	South Suburban Ord. 5 p.c.	129—134*	−1	131—134
512,825	"	"	5	5	Do. 5 p.c. Pref.	112—117*	...	116—117
300,000	"	"	—	4	Do. 4 p.c. Pref.	99—102*	...	102
868,887	"	Dec. 18	5	5	Do. 5 p.c. Deb.	120—125	...	122—124½
100,000	"	"	4	4	Do. 4 p.c. Deb.	100—103	...	...
647,740	"	Aug. 28	5	5	Southampt'n Ord. 5 p.c. max.	111—116	...	...
121,275	"	Dec. 18	4	4	Do. 4 p.c. Deb.	97—102	...	...
350,000	"	Aug. 28	5½	5½	Swansea 5½ p.c. Red. Pref.	108—113	...	...
200,000	"	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	103—108	...	...
1,076,490	"	Aug. 14	6¾	6¾	Tottenham and District Ord.	150—155	...	150—152½
409,835	"	"	5½	5½	Do. 5½ p.c. Pref. ...	125—130	...	...
62,235	"	"	5	5	Do. 5 p.c. Pref. ...	112—117	...	112
199,005	"	Dec. 18	4	4	Do. 4 p.c. Deb. ...	97—102	...	102
85,701	"	Oct. 9	6	6	Tuscan, Ltd. 6 p c. Red. Db.	90—100	...	...
349,110	"	Aug. 28	7	7	Uxbridge, &c., 5 p.c. ...	149—154	...	150
88,330	"	"	5	5	Do. 5 p.c. Pref. ...	112—117	...	...
1,322,220	"	July 10	7	7	Wandsworth Consolidated	155—160	...	158—160
1,096,378	"	"	5	5	Do. 5 p.c. Pref.	119—124	...	123½
1,317,964	"	Dec. 18	5	5	Do. 5 p.c. Deb.	120—125	...	...
158,400	"	Aug. 28	6½	5	Winchester W. & G. 5 p.c. Con.	115—120	...	...

Quotations at:—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *f*.—The quotation is per £1 of stock *g*.—For quarter. *h*.—Paid £8, including 10s. on account of back dividends. *i*.—The interest due 1/9/33 was paid on that date. * Ex. div. † Paid free of income-tax. ‡ For year. Hongkong & China, Ltd.—paid on £10 shares.

STOCK FOR SALE BY TENDER.

By Order of the Directors.

PETERBOROUGH GAS COMPANY.

Messrs. A. & W. RICHARDS

are Instructed to OFFER FOR SALE BY TENDER

£15,000

CONSOLIDATED ORDINARY STOCK,

ranking for a Standard Dividend of 7 per cent., subject to the Sliding Scale equally with the existing similar Stock now receiving 7½ per cent. dividend.

Minimum Price of Issue, £150 per £100.

Yielding at that price, 5 per cent.

Prospectus and Form of Tender (which letter must be sent in by 11 o'clock on Tuesday, 13th March) may be obtained of A. & W. RICHARDS, 37, WALBROOK, E.C. 4.

STOCK FOR SALE BY TENDER.

By Order of the Directors.

ANDOVER LIGHTING AND POWER COMPANY.

(Established 1838. Special Act, 1905.)

THE above Company is offering for SALE BY TENDER

£15,000

5% PREFERENCE STOCK.

(Minimum price of issue, Par.)

Prospectus and Form of Tender can be obtained from the SECRETARY of the COMPANY, GAS-WORKS, ANDOVER, or from the WESTMINSTER BANK, LTD., ANDOVER, or from the COMPANY'S AUDITORS, Messrs. WOOD, DREW, & CO., 139, CANNON STREET, LONDON, E.C.

The latest time for the receipt of Tenders is Twelve o'clock noon on Wednesday, March 21st, 1934.

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COPES REGULATORS LTD
5.11. THEOBALDS RD W.C.I.

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GAS, WATER, & STEAM
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A. & M. SMALL HIGH CAPACITY METERS

Where space is at a premium the A. & M. "Small" High Capacity Meter should be installed. An hourly capacity of 100 c. ft. is available in a case size equal to the old 2 light.

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